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VIEWS, NEWS AND INTERVIEWS.

"While I do not wish to condemn the advantages of water-power, there are some economies it is supposed to bring about that I find difficult to figure out in actual practice," remarked an experienced electric light man of New England to Vice-President Ord, of the General Electric Company, on the piazza of the United States Hotel, Saratoga, recently. "In displacing steam, you must remember that you seldom reduce the number of employés, and as steam has its uses often when the electric plant is quiet, there comes in a demand that electricity generated by water-power can not supply. In several of my stations I figure that water-power at $20 per horse-power per annum is not any particular economy, considering what it, in the nature of things, is supposed to replace."

It is stated that the Milwaukee Electric Railway and Light Company will spend $1,000,000 in building new lines and power plants.

A synopsis of the work done by the Boston wire department during the last six months states that the various companies using underground wires have jointly laid 60,543 feet of subway, 273,718 feet of duct and 261,311 feet of cable drawn in. There were also 344 service connections and 206 manholes built. In addition to this the Edison Electric Illuminating Company laid 37,500 feet of solid tubing and located 35 distribution boxes. The overhead division has received 780 notices, covering 3,536 defects. There has been removed by the department 697,950 feet of wire, of which 25,650 feet have been retained; the balance has been deposited on the dumps. The estimated amount of wire in the 1897 underground district is 2,765,590 feet; of that amount 2,167,150 feet are on house tops, 728 feet on fixtures and the balance on poles; 1,207,270 feet are high-tension wires.

The Taxpayers' Association has decided to press the suit against the Cincinnati Street Railway Company for $80,000 for back car licenses, which it is alleged the company has failed to pay to the city.

The great plant of the Roeblings, at Trenton, N. J., has produced many things of interest to the general public aside from their practical value from a commercial and engineering standpoint. A statement recently issued by the Roeblings specifies four of these interesting things, as follows:

When you walk from New York to Brooklyn, you do so over the great New York and Brooklyn suspension bridge, built by Roebling.

When you talk from New York to Chicago by telephone, you do so over No. 8 hard-drawn copper wire made by Roebling.

When you telegraph from San Francisco to New York, you do so over a continuous line of copper wire made by Roebling.

When you cable across the Atlantic Ocean by the Commercial Cable, you do so through copper wire made by Roebling.

New York city detectives are looking for the robber or robbers who cut down and carried off 2,500 feet of electric wire, the property of the Mount Morris Electric Lighting Company. The wire was stolen on a recent afternoon, between three and five o'clock, when a current of 2,500 volts was passing over it. This is the third robbery of the sort that has taken place in 18 months. The representatives of the company say they suspect the thief is a former employé.

Richard E. Talley has begun a suit against the Citizens' Street Railroad Company, of Indianapolis, Ind., for $2,000 damages. He, with a young lady, was a passenger on an Illinois street car, and was given a transfer to the East Washington street line. After he and the lady had boarded a car of the East Washington street line, the conductor refused to take the transfers, claiming that they had not been properly "punched," and caused the plaintiff and the lady, "much to their humiliation and shame," to leave the car.

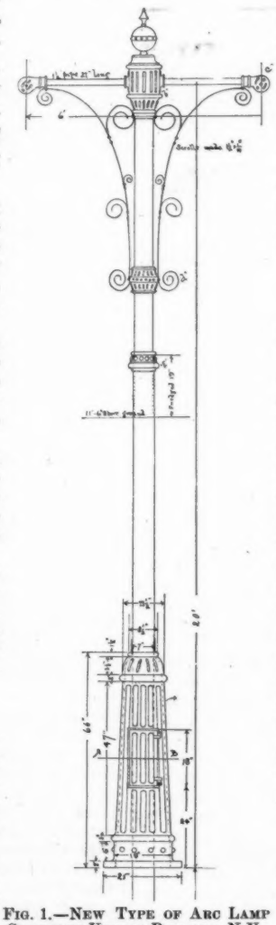

Fig. 1.—New Type of Arc Lamp Standard Used in Buffalo, N.Y.

Mr. Charles R. Huntley, of Buffalo, N. Y., vice-president and general manager of the Cataract Power and Conduit Company, and general manager of the Buffalo General Electric Company, has purchased of James M. Byers the handsome new colonial residence on Linwood avenue near Ferry street, and will make that his residence in the near future, removing from his present home at the corner of Highland and Norwood avenues.

Judge Routhier, of the Vice-Admiralty Court, in Montreal, P. Q., recently rendered judgment in the case of the Canadian Bell Telephone Company vs. the brigantine "Rapid." This was a claim for $5,000 damages on account of the company's cable across the St. Lawence, between Quebec and Levis, having been damaged by the "Rapid's" anchor. Judgment was given against the brigantine, and the court ordered the damages to be assessed.

ELECTRIC LIGHTING PROGRESS IN BUFFALO, N. Y.

GETTING READY TO DISTRIBUTE MORE NIAGARA FALLS CURRENT IN THE MAIN THOROUGHFARES OF BUFFALO—THIS CITY WILL BE ONE OF THE BEST LIGHTED IN THE UNITED STATES.

When the extensions now being made in its electric lighting system are completed, Buffalo, N.Y., will be the best lighted city in the country, in its business district at least. There have been erected on Main street, between the Buffalo River and Tupper street, 76 poles, each carrying two arc lamps, located approximately every hundred feet, alternately on each side of the street, thus giving two lamps to every 10,000 square feet of space to be illuminated. On Exchange street, from Main to Michigan, and on Seneca street, between the same streets, 27 similar poles have been put up and two other extensions of the system have just been authorized, making the total number of double-lamp poles 115, and in addition to these there has been a large increase in the number of lamps on the old overhead circuits.

The installation of the Main street lights made necessary the building of a new subway on that street and at the same time enough ducts were put in to accommodate the circuits for the distribution of Niagara Falls power. The contract for the complete installation, with the exception of lamps and cables, was given by the Buffalo General Electric Company to J. G. White & Company, of New York, the construction being similar in kind and quality to that on the underground section of the Niagara Falls–Buffalo transmission line, built by the same company last season, and fully described in the Electrical Review at that time. On Main street the subway is for the greater part of the way a 20-duct line of Camp tile, surrounded by four inches of concrete, the minimum depth of conduit being 18 inches below the surface of the asphalt pavement. Manholes are six feet by seven feet,

and seven feet deep, built with a 12-inch wall of hard-burned brick laid in Portland cement. The top of the manhole is made up of I beams, laid with nine inches between centers, the space between beams being filled with brick resting on the flanges. In the center of the hole, space is left for the double-covered casting having a 35-inch circular opening. The street covers are asphalted and entirely noiseless. Manholes are located at street intersections, and more than 450 feet apart. Opposite each lamp-pole is a small distribution box, 28 inches square, built of brick with casting and street cover similar to that of the manholes. Into these only the top course of ducts of the conduit enters, the remainder or feeder ducts passing under and forming the floor of the box. From these distribution boxes the subsidiary lines of two-inch iron pipe run to the poles, and also from each one a blind pipe is run to a point beside the pole, inside the curb line, to be used in the future for commercial service, thus avoiding the necessity for again tearing up the pavement.

The ornamental poles are of two sections of six-inch and five-inch standard wrought-iron pipe, standing 20 feet high above the curb level. The lamps are suspended from the ends of two arms, each three feet long, of two-inch pipe, screwed into the head casting, and supported also by wrought-iron scroll brackets. The poles have a heavy base casting, two feet in diameter at the bottom and five and one-half feet high, inside of which there is a cut-out switch for the lamps. The subsidiary pipe comes up under this base, and the lead-covered cable is carried to the switch, the wiring from switch to lamp being inside the pole of ordinary rubber insulated wire. No wires will show at any point, and lamps will be trimmed from a ladder. The cable used on this line is of unusually heavy insulation, and is guaranteed by the makers, the Safety Insulated Wire and Cable Company of New York, to stand a working pressure of 10,000 volts.

The coming general use of Niagara Falls power is another subject which is now interesting the people of Buffalo. Three weeks ago work was begun by J. G. White & Company on a 25-duct subway for the Cataract Power and Conduit Company, running from the Court street station of the Buffalo General Electric Company, where it connects with the system above described, built for the latter company, to Niagara street, then west nearly three miles to Albany street, where connection is made with the transmission line subway. It is expected that this line will be finished before the last of August, and that power will be furnished in the heart of the city early in October. This power subway is exactly similar to the Main street line, except that there is no distributing system.

Preparations are being made at Court street station for the installation of rotary transformers and motors, though the method of utilization of the power from Niagara, for the lighting work of the company, has not yet been determined upon. The use of combined rotary transformers and synchronous motors like an ordinary rotary, except in having two field windings, has been suggested. The investment in apparatus could thus be cut down, the machines being used as rotary transformers in the daytime when there is a heavy 500-volt power load, and, by the use of the stronger field winding as synchronous motors to drive arc machines at night. It now hardly seems probable that this scheme will be adopted, as the manufacturing companies do not wish to redesign their machines. The very low frequency, 25 cycles, of the Niagara Falls power current makes it impossible to utilize it directly for lighting and makes the most economical method of using it an interesting problem, which has never before been met in this country.

The National Electrical Code.

The long-desired uniformity in the Code of Rules for Electrical Installations would seem to have now become an accomplished fact, as the new edition of the Rules of the National Board of Fire Underwriters, as recommended by the Underwriters' National Electric Association, recently issued, is identical with that which has received the unanimous approval of the code committee of the National Conference on Standard Electrical Rules, who have referred it to the various delegates in the conference, with recommendation that they report it to their respective organizations for adoption or approval.

It has been thought advisable that in presenting these rules to the public, they be accompanied by a sketch of the manner in which this uniformity of rules has been brought about, and this article has been prepared jointly by the code committee of the National Conference and the committee on press of the Underwriters' National Electric Association, in order to show the various stages through which these rules have passed, and the successful work of the National Conference in securing harmony among the divers interests which they affect.

As the adoption of a uniform set of rules for the safe installation of electric light and power apparatus, by the electrical, insurance and allied interests, marks a distinct epoch in the history of rule-making in this country, it seems a proper time to give a brief outline of the evolution of electrical rules from the crude beginnings of 15 or 16 years ago up to the present time, when the rules in force are as nearly perfect as the combined experience of interested parties has been able to make them.

After a large amount of correspondence, inquiry, and consultation of records, the following data have been collected.

It seems that to the New York Board of Fire Underwriters belongs the credit of the first printed requirements in relation to electric lighting. On October 19, 1881, a circular was issued by that board containing the following resolution:

"*Resolved*, That the committee on police and origin of fires are hereby directed to notify the owners and occupants of all buildings in which uncovered electric light wires, or in which arc lights with open bottoms or without globes, are found, that the wires must be covered, and the lamps altered to conform to the rules of this board within 10 days from date of notice, and request that the lights shall not be used until the alterations are made; and in case the alterations are not made within said time, the committee are hereby directed to notify the members of the board of said failure, and the companies insuring said property are hereby recommended to give notice to the owners and occupants of such buildings that unless the request is complied with, and the alterations made within a reasonable time, that the insurance on said property will be canceled."

The Boston Manufacturers Mutual Fire Insurance Company comes in one day later, with a circular dated October 20, 1881, calling attention to the same hazards from arc lighting.

Under date of January 12, 1882, the New York Board issued a very brief circular containing a few rules for the installation of electric lights; and in January, February and March of the same year, the Boston Manufacturing Mutual Fire Insurance Company issued circulars on this subject, in which the elements of later developments are shown by the classification of the requirements under the headings of Dynamo Machines, Wires, Arc Lamps and Incandescent Lamps.

On May 19, 1882, the National Board of Fire Underwriters adopted the standard requirements of the New York Board for the installation of electric lights, and in the same month the Boston Board of Fire Underwriters issued a circular containing similar rules.

On August 1, 1885, the New England Insurance Exchange issued rules covering both arc and incandescent systems. Previous to that time they had used the rules of the Boston Board, issued in 1882. The rules of the New England Insurance Exchange were perhaps the most complete that had yet been put in print, and in a report of the electric light committee of that body, it is stated that in the arrangement of these rules they were "largely aided by some of the leading electric light people."

At a meeting of the National Electric Light Association in Baltimore, in 1885, a representative of the Boston Board, and also of the Boston Manufacturing Mutual Fire Insurance Company were present; and while there was considerable talk and discussion on the matter of rules, nothing was carried to an issue. In the following Summer a joint conference of certain insurance representatives and members of the National Electric Light Association insurance committee formulated rules, which were later presented to the National Electric Light Association, but were not adopted. The rules resulting from this conference were promulgated simultaneously by the Boston Fire Underwriters' Union and New England Insurance Exchange, under date of May 15, 1889, and these rules, it may be said, were the first which fairly deserve to be called comprehensive, as the rules of other insurance boards, as late as January, 1890, were still very brief and incomplete.

In February, April, July and August, 1890, quite complete rules were issued by the Philadelphia Underwriters' Association, Underwriters' Association of New York State, and the Pacific Insurance Union, and jointly by the Boston Fire Underwriters' Union, Boston Manufacturing Mutual Fire Insurance Company, and the Electric Mutual Insurance Company.

In August, 1890, at the Cape May meeting of the National Electric Light Association, a joint conference between members of the association and insurance representatives was held, which agreed on a large number of points, which were reported to the National Electric Light Association, and a conference committee, consisting of representatives from the insurance and electrical interests, was formed under the name of the National Electro-Insurance Bureau.

In September, 1890, the New England Insurance Exchange prepared, in conjunction with a committee from the New England Electric Exchange, a set of rules which met with the hearty approval of the Electric Exchange, and on November 18, 1891, the New York Board of Fire Underwriters also issued a set of rules.

In September, 1891, the National Electric Light Association adopted the code of rules prepared by the National Electro-Insurance Bureau, which were the first published by that association; but as there was no special effort on the part of that association or the Electro-Insurance Bureau to secure the general adoption of the rules, they were adopted by only three or four insurance boards, covering a small portion of the United States; and some of these boards in publishing the rules made changes to suit themselves, basing their rules on those adopted by the National Electric Light Association at their 1891 meeting. Most of the insurance boards continued to use the rules which had so recently been sent out by them, as they had no pressure brought to bear upon them in the interest of uniformity.

In the early part of the year 1892 the secretary of the New England Insurance Exchange, in the interests of uniformity of rules, corresponded with the electrical inspectors of the various underwriters' organizations in the eastern part of the United States, suggesting that a meeting be held in New York city in August. This idea seemed to meet with favorable consideration, and on August 18 representatives of the underwriters' boards, covering the New England, Middle, South Atlantic and Gulf States, met in New York, and taking as a basis the rules which had been adopted by the National Electric Light Association, they carefully considered them, section by section, in order to make such changes as the experience of the insurance inspectors indicated to be necessary in the interests of the insurance companies.

The interest in this effort for uniformity of rules, so far as the insurance companies were concerned, was so great that it was decided to hold a meeting in New York in December of the same year, and to invite the inspectors of all the insurance boards in the United States and Canada to be present. The rules, as revised at the first meeting, were put in print; copies were sent with the call for the meeting to be held on December 6; and it was also voted that a committee take into consideration the matter of permanent organization. The response to the invitation to this meeting was very favorable, and representatives were present from underwriters' organizations which covered practically the whole of the United States and a large part of Canada. A permanent organization was effected and an electrical committee appointed, consisting of electricians in the employ of the insurance interests, whose duties were to be the care of the rules, the making of tests, and the giving of information and advice to members of the association. The proof of rules prepared at the August

meeting was again carefully gone over and revised, and the members present pledged themselves to use their influence to have their associations adopt these rules.

Proofs of the rules were sent to various prominent electrical interests, with a request that they examine them, and submit any suggestions which they might desire to make. The committee received a report from the officers of the Edison Electric Illuminating Company, of New York city, in which it was stated that these rules in general were far in advance of any heretofore published, so far as they were aware, either here or abroad.

These rules were issued under date of March 20, 1893, and were almost immediately adopted by the following fire underwriters' organizations.

National Board of Fire Underwriters.

New England Insurance Exchange.

New Hampshire Board of Fire Underwriters.

Boston Board of Fire Underwriters.

Suburban Underwriters' Association.

Underwriters' Association of New York State.

Philadelphia Fire Underwriters' Association.

Underwriters' Association of the Middle Department.

Pacific Insurance Union.

Western Union.

Association of Fire Underwriters for Arkansas.

Chicago Fire Underwriters' Association.

Cleveland Board of Underwriters.

Underwriters' Association of Cincinnati.

Detroit Board of Underwriters.

So that, with the exception of New York city and the South Atlantic and Gulf States, very general uniformity of insurance rules was secured in less than one year after the first meeting of the insurance inspectors.

The next meeting of the Underwriters' National Electric Association was held in Chicago on August 17, 1893, and an adjourned meeting was held in Boston on September 5. The rules were again gone over carefully, section by section, revised and amended. The general subject of the rules was divided into classes, and each member of the electrical committee assigned to some particular subject as his special field.

At the Washington meeting of the National Electric Light Association, beginning February 27, 1894, a revised edition of the rules of the association was presented by the Committee on Safe Wiring, and adopted. Under date of June 15, 1894, the Underwriters' National Electric Association issued a bulletin advising that the New York Board of Fire Underwriters, covering New York city, Buffalo Association of Fire Underwriters, Michigan Inspection Bureau, Southeastern Tariff Association, Milwaukee Board of Fire Underwriters, Memphis Board of Underwriters, had adopted the rules of the association, and in August, 1894, the Associated Factory Mutual Fire Insurance Companies also adopted the rules, with a few modifications, so that in less than two years, so far as the insurance rules were concerned, uniformity had been secured; and at the meeting of the association held December, 1894, on account of the fact that certain boards had issued some slight amendments and additions supplementary to the rules, thus, to a certain extent, destroying the uniformity which had been secured, it was voted that the secretary correspond with the various associations, asking them to have their rules printed only by the National Board of Fire Underwriters, and to make no changes in, or additions to, these rules, except as promulgated through the national board on recommendation of the electrical committee of the Underwriters' National Electric Association.

In the meantime a bureau for the testing of devices and materials and for the dissemination of information had been established at Chicago, in charge of a member of the electrical committee, and quarterly reports were issued containing brief accounts of fires in all parts of the country due to electricity; also bulletins were issued from time to time containing reports of tests of wires, devices and materials.

(To be concluded.)

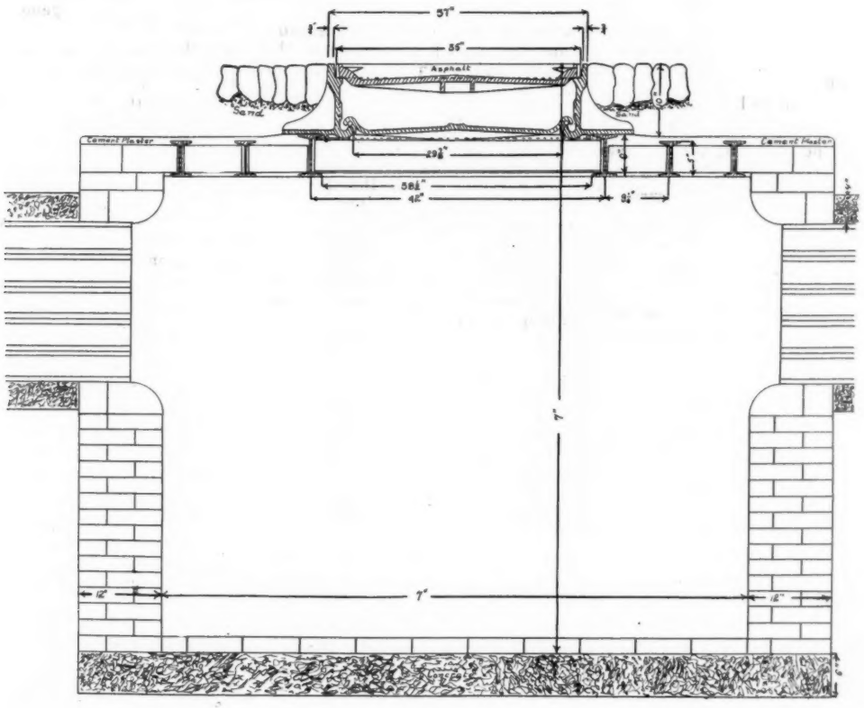

FIG. 2.—STANDARD TYPE OF SUBWAY MANHOLE IN USE AT BUFFALO, N. Y.—(See page 73.)

Lord Kelvin on Inflammable Hair-Wash.

Lord Kelvin recently sent the following communication to the London *Times*:

"As a warning that may possibly be useful in preventing the recurrence of any such terrible accident as that which recently happened through the ignition of an inflammable hair-wash, it ought to be generally known that the faintest electric spark suffices to ignite an inflammable mixture of a combustible gas with air. This is illustrated in elementary lectures on electricity by "Volta's cannon," a little varnished brass gun, mounted on a glass pillar, and having a wide touch-hole plugged with sealing-wax, in the centre of which is mounted a brass wire, carrying a little brass knob outside and projecting inside to within one-twentieth of an inch of the end of another brass wire fixed to the metal of the gun. The gun is filled with an explosive mixture of oxygen and hydrogen, and its muzzle is plugged with a cork. The varnished outside is struck with a piece of catskin, and, thus electrified, the gun is left insulated on its glass pillar. To fire it, all that is necessary is to touch the projecting knob with the finger. This causes discharge of the electricity by two exceedingly faint sparks, one barely, if at all, perceptible by the finger before contact with the knob outside, the other in the one-twentieth of an inch air space within the explosive mixture inside. A loud explosion is heard, and the cork is projected with sufficient violence to tear a canvas picture if it chances to touch one. Ignition of vapor of benzine by electric spark is well known to dyers in their process for cleaning silks and other fabrics by boiling in large cauldrons of liquid benzine. When the goods are taken out of the cauldron and spread out to dry on a table, explosions have often taken place, and I believe it is quite certain that an electric spark, caused by some slight friction between dried or partially dried portions of the fabrics, is the incendiary. We all know how readily electric sparks, visible in the dark, and perceptible to the ear by slight crackling sounds, are produced by drawing a hand over very dry hair, or the teeth of a comb through it. In the recent inquest, it was stated that the merit of the hair-wash was that it dried so readily. The hairdresser said he felt the hair warm in his hand, and immediately after that all was enveloped in flames. The fact that the hair seemed warm to the hand was due not to the beginning of some kind of spontaneous combustion, as must, I believe, have been imagined by many readers of the report. It showed merely that the part of the hair touched had quickly become dry. Very slight friction of the hand on the dry hair would suffice to produce an electric spark, and the explosive atmosphere of air, mixed with combustible vapor from the portions of the hair not yet dry, was there. The conclusion of the inquest shows that no gas was burning in the neighborhood, and that no lucifer matches were lying about on the floor which could have been ignited by being trodden on. A gas flame within a yard or two of the place would certainly have been dangerous, but far less apt to produce the disaster than an electric spark from the hair in the very place of greatest liability to the presence of an explosive mixture."

Mr. Campbell Scott.

Among the newcomers to New York is Mr. Campbell Scott, of the C & C Electric Company, who, for the last six or seven months, has been in charge of the C & C company's Atlanta office as southern manager, in which position he succeeded in getting the C & C apparatus thoroughly established in the South. The business of the C & C company has been so rapidly increasing during the last two months that it was found necessary to recall Mr. Scott to the New York office, 143 Liberty Street, where he will be located in the future. Mr. Scott will have charge of the sale of his company's apparatus in Greater New York, besides acting as advertising manager.

The Boston Subway.

It was announced last week that the Boston subway will be open to traffic on the morning of September 1. All cars making the Tremont House station their terminus will be run through the subway. This traffic amounts to 50 per cent of the electric car travel at present carried on Tremont street.

A Shrewd Little Passenger.

Conductor—How old are you, little girl?

Edna—You will have to ask ma. She always takes charge of my age in a street car.—*Brooklyn Life.*

TELEPHONE NEWS AND COMMENT.

The Detroit Telephone Company has filed a $750,000 mortgage in favor of the Guaranty Trust Company, of New York.

On August 1 the New England Telephone and Telegraph Company commenced the operation of all its city and suburban exchanges during the night hours, with women operators. About 30 men operators were dismissed in making the change.

While setting poles across New Rochelle Creek, several linemen of the New York Telephone Company were almost buried in mud, because one of the poles fell on them. One of the men was so badly hurt as to necessitate his removal to the Yonkers Hospital.

The Commercial Cable Company announces: The Eastern Telegraph Company advise the West Coast route to the Cape of Good Hope is interrupted for repairs. There is very heavy delay and messages can only be accepted at sender's risk, to go by first and best means.

The Citizens' Telephone Company, of Laconia, N. H., started with about 80 subscribers on January 1, 1897, and now has 212 in that city. The company is now building trunk lines to Tilton and Franklin, with exchanges aggregating 175 subscribers in the two towns. The success of this independent company in Laconia had been so pronounced that the contracts with the 175 subscribers above mentioned were secured and stock subscribed twice over before construction began.

Telephone booths have been placed at each of the Brooklyn Bridge towers. They are roomy and entirely different from the dismal sheds right around from them on the other side of the towers, put up 14 years ago, on the completion of the bridge. With the increased traffic on the bridge, Superintendent Martin says, it is necessary that communication be made easy between all points on the bridge, particularly now that it is proposed to run trolley cars and elevated trains across the bridge.

The Utica, N. Y., Telephone Company has been enjoined by the city from proceeding further in the construction of its plant. A short time ago the City Council refused to give the company a franchise. An opinion was then promulgated to the effect that the company, if properly incorporated, could proceed without a franchise, and construction work was therefore begun. The present injunction, which the company will endeavor to have set aside, has stopped operations at least for the present.

Telephone extensions are now in progress in South Dakota, which will result ultimately in connecting Sioux Falls with Sioux City, Iowa, and St. Paul, Minn. An officer of the Northwestern Telephone Company recently referred to the matter as follows: "The Iowa Telephone Company has heretofore owned the lines from Sioux City to Elk Point, Vermillion, Akron and Hawarden, but these have been purchased by the Northwestern Telephone Company, which has 3,000 miles of line in Minnesota and the two Dakotas. The Northwestern already had a line from Sioux Falls to Canton, and might have made a connection with Sioux City by merely building from Canton to Hawarden. It was determined to rebuild the line, however, in order to make it more thoroughly reliable. We are also building from Elk Point to Scotland and Centreville, and are securing the right of way for these extensions."

The output of the American Bell Telephone Company for the month ending July 20, was as follows:

	1897.	1896.	1895.
Gross output	15,859	12,594	13,887
Returned	7,241	10,490	7,513
Net output	8,618	2,094	6,324
Since December 20:			
Gross output	127,778	126,678	98,896
Returned	51,847	53,667	47,121
Net output	75,931	73,011	51,775
Total outstanding	849,780	749,547	634,283

The dividend of $1.50 per share, paid by the New England Telephone and Telegraph Company on August 16, was an increase of one-quarter per cent per quarter, and is at the rate of six per cent a year, against five per cent formerly. The quarterly dividend was increased from one to one and one-quarter per cent August, 1895. There is no special significance to this advance in the dividend rate. The directors found that the earnings for the quarter warranted an advance in the rate to one and one-half per cent, and they so declared. Earnings this year have shown about the same steady ratio of increase as for several years.

A Commercial Directory of the American Republics.

To the Editor of Electrical Review:

It may be of interest and benefit to many of your readers to know that the Bureau of American Republics has in an advanced stage of preparation a commercial directory of the American Republics and European dependencies in Central and South America and the West Indies. The volume will be a handsome quarto, 9 by 12 inches, of over 1,200 pages, and will embrace in its contents the following information:

1. Reliable descriptive, geographical, industrial, commercial and statistical data and a map of each country.

2. The addresses and lines of business of the commercial houses of Latin America and the Hawaiian Islands.

3. The names of 5,000 or more representative manufacturers, merchants, shippers and bankers of the United States, interested in foreign trade, classified under proper headings.

4. The names of commercial and trade organizations, associations and unions of the countries embraced in the international union of American Republics.

5. Valuable data of transportation companies and trade routes by land and water; railway, telegraph and cable facilities; and particulars as to shipping, port regulations, tariff and customs laws; patent, trade-mark and copyright laws and commercial licenses, passport, and postal regulations.

The above information has been secured from the most reliable sources, with a view to accuracy and completeness, and I feel assured it will meet the specific requirements of all lines having and seeking foreign trade. To all who apply, specimen pages and subscription blanks will be forwarded.

Requesting your valuable co-operation in imparting to manufacturers, merchants, shippers, bankers and others a knowledge of the approaching completion of this great work which I believe you will recognize as being not only of practical utility but of international importance, I remain

Very respectfully,

Joseph P. Smith, Director.

Washington, D. C., August 10.

ELECTRIC RAILWAY NOTES.

A trolley sprinkling car is doing good service in Paterson, N. J.

The Metropolitan Traction Company, of New York city, has decided not to use double-deck cars.

Mr. G. F. Greenwood, superintendent of the Consolidated Traction Company's lines in Pittsburgh, has devised an automatic electric track switch, which is reported to be a practical success.

Commissioner of Public Works Collis has granted a permit to the Metropolitan Street Railway Company, of New York city, for a change of motive power to electricity on the Twenty-third street and Fifty-ninth street crosstown lines.

It is reported that the Middletown-Goshen, N. Y., Traction Company will consolidate with the Newburgh, Orange Lake and Walden electric line, thus forming a circuit of Orange County. The survey between Walden and Goshen has already been made.

The Haverhill & Amesbury, Mass., Street Railway Company carried more passengers during the month of July just passed than they ever carried in any month since the beginning of the road. The number was 277,011 passengers, an increase of 53,000 over the corresponding month last year.

Judge Fish has confirmed the sale of the Belle City, Wis., street railway, to Frank J. Miller, the purchase price being $150,000. Receiver Smith's claim for services of $3,000 was cut to $1,750. A new company composed of old bondholders has been organized to take charge of the road.

At the annual meeting of the stockholders of the Cincinnati, Ohio, Street Railway Company the board of directors and officers were re-elected. The gross earnings of the company were about $2,300,000, and the net earnings are about $900,000, or enough to declare a dividend of five and one-half per cent on the capital stock of $16,000,000.

Versailles Borough Council passed an ordinance over the burgess' veto, granting the West Newton & Youghiogheny, Pa., Street Railway Company right of way through the borough. The company will sell six tickets for 25 cents, and expend about $15,000 on street improvements. The road will extend from West Newton to McKeesport, about 19 miles. Work will be commenced at once.

It is reported that within the next 60 days the North and West Chicago street railroad companies will expend $1,500,000 in building new electric lines and remodeling old ones. Nearly 30 miles of double track will be added to the present systems. Superintendent John M. Roach has let the contracts for both divisions of the city, and work will begin at once. The steel rails required will come near to 8,000 tons and there will be used about 50 miles.

Homer Loring, of Boston, and George B. Morley, of Saginaw, Mich., have been appointed receivers for Union Street Railway Company, of Saginaw, upon application of the Boston Safe Deposit and Trust Company, which company also asked that a temporary injunction be issued against the city, restraining it from disposing of the street railway franchise. The Union street railway gives notice of appeal to the Supreme Court.

General Manager Bannister, of the Westinghouse Electric and Manufacturing Company, is now in London and will soon be in conference with Treasurer Kobbe, and the counsel of the company, Mr. Paul D. Cravath. These three officers of the Westinghouse Company are now all abroad upon both business and pleasure, and Mr. Bannister writes very favorably from London of the prospects for the English Westinghouse Company, in which the American company has a very large interest.

Papers have been filed with the Secretary of State certifying to the consolidation of the Oneonta, N. Y., Street Railway Company and the Oneonta and Otego Valley Railroad. The consolidated company will be known as the Oneonta and Otego Valley Railroad, and will have a capital stock of $100,000. Its directors are: Frank Gould, A. C. Moody, A C. Lewis, Parker Wilson, A. D. Getman, C. Van B. Pruyn, H. H. Getman, Squire B. Gardner and D. W. Miller, of Oneonta.

The Hagerstown, Md., Electric Railway Company recently reduced the wages of the conductors from 12½ cents an hour to 11 cents, and the wages of the motormen from 15 cents to 13 cents. The men are required to wear high standing collars all the time, in hot weather as well as cold. They complain of being overworked. Employés of other industrial works are said to be getting out a petition, the signers pledging themselves to boycott the road until the old schedule of wages is resumed.

The Use of Transmitted Current in Sacramento.

The electrification of Sacramento, Cal., is proceeding apace since the introduction of the current generated at Folsom, 24 miles away, demonstrated the cheapness of electrical power when compared with steam power. Electricity is now used in Sacramento to drive machinery of all kinds, and is entering largely into what may be called the household life of the city. One of the most important motor installations is that driving the machinery in the shops of the Southern Pacific Railway Company. At about the time this was effected, the Buffalo Brewing Company, of Sacramento, substit ted motors for the steam engines upon which it had previously been dependent for power, with gratifying results.

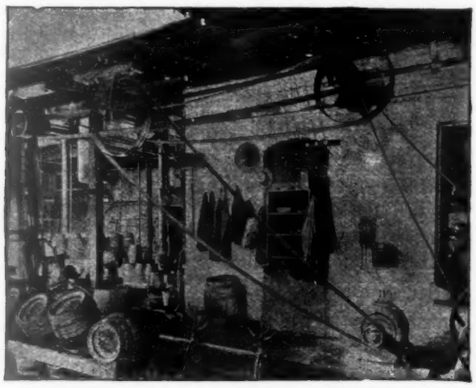

FIG. 1.—TEN-HORSE-POWER INDUCTION MOTOR IN KEG-WASHING DEPARTMENT, BUFFALO BREWING COMPANY, SACRAMENTO.

This brewery is one of the largest on the Pacific Coast. Its present motor equipment consists of one 5-horse-power, one 10-horse-power and one 20-horse-power, and two 30-horse-power motors. They are all of the General Electric Company's three-phase induction type, without brushes, collector rings or moving contacts, and run almost without attention beyond an occasional oiling. They are driven by 200-volt current supplied from the 1,000-volt circuit, running from the sub-station a distance of two miles, the pressure being transformed down at the brewery.

The smallest motor is used in the bottle-washing house; that of 10 horse-power in the keg-washing department. The three others are used to operate the blowers, the malting house and the machine shops. The large ammonia pumps in the brewery will also shortly be driven by electric motors.

The printing presses of Day & Joy, in Sacramento, are also driven by motor. In this case the motor is of similar type to those in the brewery but of 10-horse-power capacity. It was one of the first in the city to take current of the long-distance transmission. On the day of its installation, the eight-horse-power engine formerly used was draped in crape. Its usefulness had departed, with its noise, heat and discomfort. The motor now drives one four-roller Huber cylinder press, one Cottrell press, and two job presses, and although it has been in use a number of months has not involved the firm in a cent for repairs.

In installing the Buffalo Brewing Company motors the question of the probable economy of the change was naturally uppermost. Would it pay to dispense with the steam and trust to the motors? The guarantee finally given was that electricity would show a saving of 40 per cent. After the motors had been running for some time, a series of tests were made, with the result that the saving instead of 40 per cent was shown to be actually a little over 50 per cent. Results almost similar have been obtained in other installations in Sacramento. It is hardly a matter of surprise that with such showings to do missionary work, the use of electricity is rapidly extending in that city.

FIG. 2.—FIVE-HORSE-POWER INDUCTION MOTOR IN BOTTLE-WASHING HOUSE, BUFFALO BREWING COMPANY, SACRAMENTO.

Boston Electric Light Company.

At the annual meeting of the stockholders of the Boston Electric Light Company, held on August 10, all the old board of directors were re-elected, excepting that William A. Paine was chosen in the place of Isaac Fenno, deceased. The meeting also appointed a committee of three stockholders to select an auditor in compliance with the State law. F. A. Gilbert was re-elected president; E. B. Maltby, vice-president, and Samuel S. Sias, clerk and treasurer.

The local street railway at Quincy, Mass., is equipping one of its single-track lines with block signals, to prevent cars moving in opposite directions from meeting on turn outs.

ELECTRIC LIGHT FLASHES.

Mr. E. A. Leslie, general manager of the Manhattan Electric Light Company, of New York city, is enjoying a vacation in Europe.

The capacity of Marquette's, Mich., city lighting plant will be doubled. An addition to the plant, to cost $13,000, will be completed by January 1 next.

The Cleburne, Tex., Water, Ice and Lighting Company has filed a deed of trust, the Atlantic Trust Company being named as trustee. This was done to float $60,000 worth of six per cent bonds. They are going to make improvements.

The Buffalo General Electric Company, of Buffalo, N. Y., last week filed papers with the Secretary of State certifying to an increase in the capital stock of the company from $1,900,000 to $2,400,000. The liabilities of the company, irrespective of its capital stock and interest due on bonds on August 1, are $10,808.26.

A contract for building the tunnels, etc., in connection with the electric power plant in the Santa Ana canyon has been filed. According to its terms the Southern California Power Company has contracted with E. F. Phelan, of Los Angeles, for this work, which is to be done by January 29 next, at a cost of about $100,000.

The Caledonia Electric Light and Power Company, of Owosso, Mich., has been notified by the City Council to turn off all of the city lights. The board of public works recently reported an estimate of $10,000 being necessary to establish an electric light plant. The city has been recently paying at the rate of $60 per arc light per year. It will now live in darkness.

The attorney for the District has decided that the United States Electric Lighting Company, of Washington, D. C., has the right to extend its underground conduits and wires east of Rock creek and within the city limits to Mount Pleasant, Washington and Columbia Heights. It also has the right to extend its conduits and wires by way of Sixteenth street to Mount Pleasant, under such regulations as the commissioners may prescribe.

The United States Electric Light Company, of Washington, D. C., will begin at once the erection of an addition to their present plant at the corner of Fourteenth and B streets northwest. The new structure will be 134 feet square, built of brick and stone, and be of massive construction. The building will rest upon a very strong foundation of piles and concrete, capable of sustaining the heavy machinery which will be installed therein. It will be one story and basement, and will cost about $75,000, the foundations alone costing over $24,000.

FIG. 3.—TEN-HORSE-POWER INDUCTION MOTOR IN PRINTING OFFICE OF DAY & JOY, SACRAMENTO.

LITERARY.

Walter A. Wyckoff, in the September *Scribner's*, tells in his narrative, "The Workers," what one of them thought of Shakespeare: "When I go to the theater, I go to laugh. I want to see pretty girls and lots of them, and I want to see them dance. I want songs as I can understand the words of, and lots of jokes, and horse-play. You don't get me to the theater to see no show got up by Shakespeare, nor any of them fellows as lived 2,000 years ago. What did they know about us fellows as are living now? Pete, you mind that Tim Healy in the union, him that's full of wind in the meetings? Onct he gave me a book to read, and he says it's a theater piece wrote by Shakespeare, and the best there was. I read more'n an hour on that piece, and I'm damned if there was a joke into it, nor any sense neither."

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, AUG. 18, 1897.

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The use of the long-distance telephone is constantly increasing. Manufacturers and others convenient to the main line between New York and Chicago find it to their advantage to contract by the year for thousands of dollars' worth of messages, and receive a special discount. This method also pays the telephone company—the American Telephone and Telegraph Company—as it assures a large business, and tends to develop the demand for the long-distance telephone service.

In view of the widespread interest now being taken in the republic of Hawaii, it may be noted that the islands of Oahn, Kauai and Hawaii have telephone systems covering all accessible points. On the island of Maui the telephone system is established only in part. The rentals are moderate, and the charges at public stations are reasonable.

In his paper on "Electric Metering from the Station Standpoint," published in this issue of the ELECTRICAL REVIEW, Mr. Caryl D. Haskins makes an interesting assertion. He states that reliable data prove the fact that the average electric lighting station can do one-third more business with the same station capacity on a meter basis than it could upon a contract basis. In other words, "it is apparently well established that 33⅓ per cent represents the average wastefulness of average human nature in connection with the use of light."

Paterson, N. J., is in darkness, as an indirect result of the coal-miners' strike. Not an electric light is burning in the city. The residents are going about at night armed with revolvers, and are beginning to realize the old axiom that "an arc light is as good as a policeman." The management of the local Edison company in Paterson feared that there would be a shortage in the coal supply owing to the miners' strike, so the company's coal bunkers were hastily filled to their utmost capacity. The other day the bunkers gave way and let the coal down into the boiler room, completely burying the boilers. The boilers are now being rescued by gangs of men digging out the coal.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

This association will hold its annual meeting this week at Toronto, Ont., beginning Wednesday, August 18, and closing August 25. A large number of prominent scientists from foreign countries will be present. Probably the best known of these is Lord Kelvin, who arrived in New York city last Friday on his way to Toronto. The programme of the meeting includes a large number of interesting papers on electrical subjects. Nikola Tesla has sent to the meeting one of the smaller of his electrical oscillators accompanied by descriptive notes. The meeting promises to be one of the most important held by this association, and is one of the very few ever held outside of England itself. The ELECTRICAL REVIEW extends a cordial greeting to the visiting scientists from abroad.

MOSES G. FARMER.

The recent meeting of the American Institute of Electrical Engineers, at the Maine home of Moses G. Farmer, has attracted the attention of the press and public to the achievements of this noted toiler in the early electrical field. To honor the name of Farmer was a fitting act on the part of the Institute. The following extract is from Professor Dolbear's address, delivered at Greenacre, Me., and is a review of the work of this distinguished man that it is very proper to bring to the attention of the later workers in the electrical field:

At 26 he had built an electrical railroad; at 28 he had improved the telegraph; at 30 he had invented and constructed the fire-alarm system with water-power driven dynamos; at 35 he had discovered the means for duplex and quadruplex telegraph, and at 36 the art of depositing aluminum electrolytically. At that age he read a paper before the American Association for the Advancement of Science on multiplex telegraphy. At 39 he had lighted his parlor in Salem with incandescent lamps; at 44 he had greatly improved thermo-electric generators; at 46 he had invented the modern dynamo with self-exciting field, and at 48 had lighted a house in Cambridge with 40 incandescent lamps in multiple circuit, and all properly self-regulating. There is good reason for believing that the introduction of the condenser into telegraph work, which so enormously increased the working capacity of the line, was his invention.

Like many other pioneers, his work came too soon for him to profit greatly by it. It is this generation that receives the benefits. His early patents and machines and descriptions have prevented the monopolizing of some fundamental principles by the great establishments which now try to control the electric industries and prevent competition.

He himself did not herald his inventions. Those who profited by them were content to pocket the receipts and say nothing, and men of science ignored him—first, he did not belong to the schools, and, second, because it was not thought by them to be proper for a scientific man to patent his inventions.

The logical outcome of the transportation problem in Greater New York will be a consolidation or alliance of the surface and elevated roads of Brooklyn and New York, with electricity as the motive power. To be able to go from the Harlem River to Manhattan Beach without change of cars is a very desirable and undoubtedly feasible end to be attained.

Electrical manufacturers of the United States could make a magnificent exhibit at the Paris Exposition of 1900. We hope to see the wonderful progress made in this field fittingly represented by a thoroughly comprehensive exhibit.

Interesting Information on Tesla Coil Experiments.

To the Editor of Electrical Review:

Since the publication in a previous number of the Electrical Review, of some suggestions I made to a subscriber of your journal relative to the construction of a Tesla coil, or high-frequency transformer, of small dimensions, a large number of inquiries have been addressed to me, which I have been unable to answer owing to lack of opportunity. As these inquiries have been made evidently by persons in possession of ordinary induction coils, of moderate power, I propose to help them in a measure by giving, through the medium of the Electrical Review, the benefit of my experience.

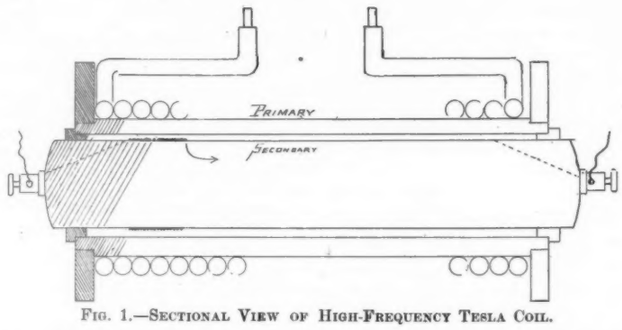


Fig. 1.—Sectional View of High-Frequency Tesla Coil.

In the first place I desire to state that my results have been attained largely through the extreme kindness of Messrs. Tesla and Thomson, both of whom have been generous enough to respond to early correspondence on the subject of high-frequency coils.

Of course the best effects have been produced by specially constructed transformers. At the same time the ordinary induction coil, if it possess the efficiency claimed for it, in modern construction can be made to do good work in connection with a suitable condenser and high-frequency transformer. When properly built these small transformers make excellent exciters for the double-focus type X-ray tubes. The present suggestions are for a high-frequency transformer operated by ordinary induction coils from three-inch spark upward.

Fig. 1 shows the method of construction with an arrangement of winding different from that shown in my first communication. In the present type the primary winding is placed on the outside. A hollow wooden spool is provided, 12 inches in length, three inches in diameter, with the interior bored out to a diameter of two inches. If desired each end can be turned down one-half inch in width, and one-fourth inch in depth, to provide a position for two cheek blocks, sometimes to be employed with advantage, especially as resting feet for the coil. Two wooden washers are then turned with the outer diameter to fit the interior of the large spool, and these washers have a central opening one and one-half inch in diameter. Through these washers is inserted a central wooden spool turned to fit 13 inches in length, and on this inner spool the secondary winding is placed. A brass binding post screwed into each end of the inner spool serves to give outlet to the secondary winding, and is of some advantage as a permanent connection for the secondary winding when it is desired to experiment much with different primaries, and it becomes necessary to handle the coil much.

From 20 to 25 turns of No. 8 heavily insulated wire is wound on the outer surface, and approximately 250 turns of double silk covered No. 26 to No. 28 wire is wound in one layer, on the inner spool. This gives a ratio of 10 to 1, in transformation, but as Tesla has said, this ratio may be even much greater when the condenser is discharged through the primary. I have found that any estimate is liable to be far from the truth, for the secondary discharge, varying as it does with different conditions at the spark gap, is hard to estimate. My experience has been that different induction coils require different condenser capacities, due probably to the fact that the resistance of the different secondaries, and consequently the quantity output of the coils used, varied. Generally speaking, a condenser made of a plate of good glass, and having a tinfoil surface of about 50 to 90 square inches on each side, is sufficient. With such a condenser and winding as given, energized by a coil giving three to five-inch spark, the terminals of the high-frequency coil give a fairly heavy stream of sparks about three inches in length. I have found, however, that the spark length of a high-frequency transformer does not always measure its efficiency. For instance, one induction coil of larger spark rating — 10 inches — with slightly different condenser capacity, gave high-frequency streams, four inches between terminals of high-frequency coil, while the snapping spark similar to that given by the ordinary coil, scarcely exceeded one inch in length. Yet this particular high-frequency coil has been the best energizer of tubes that I have tried. It was evident that the frequency was great, due, as I afterwards discovered, to a primary winding of very heavy wire and few turns. With insufficient education in these matters, progress can be made only by incessant experiment, and the coil I submit for the benefit of my amateur friends is one which can be readily taken out of the oil bath necessary for its efficient operation, and experimental windings can easily be substituted for those here given. The spark gap and condenser connections are shown in the sketch. Fig. 3 shows a completed coil for high-frequency work, constructed by me.

With this form of coil, intelligently operated, many of Tesla's beautiful experiments are readily made, besides those which may occur—as they surely will—to the experimenter. Two years of high-frequency experimenting has been one of my chief pleasures and a never failing source of entertainment to friends. The full measure of satisfaction was attained, however, when the double focus tube came into the market and I found my high-frequency coil ample for X-ray work.

Elliott Woods.

Washington, August 12.

The Careful Editor and the Lightning.

[*From the American Machinist.*]

As our readers know, our editorial rooms are in the top story of one of the modern sky scrapers, at nearly the height of the top of the Bunker Hill Monument. Already this season we have had one or two lively thunderstorms playing about our ears, and on another building in the vicinity a flag-pole was shattered in the last attack. It is probable, however, that the inmates of these buildings have not been in the least danger, the masses of steel having more attraction for the subtle fluid than the human body has, so we sit quietly, and with unruffled minds watch the flashes and the darting streaks. It would probably be unsafe, however, to stand on the roof when one of these storms is in business, and we do not propose to try it.

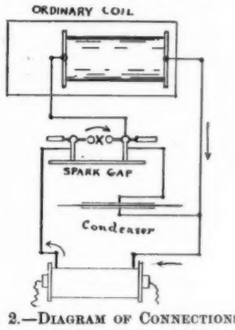


Fig. 2.—Diagram of Connections.

The Borough Council of Ephrata, Pa., has awarded the contract for lighting the streets with twenty 3,000-candle-power long-burning arc lamps, to run until midnight, at $65 a year, to F. E. Bailey, of Philadelphia. A company has been organized and a site secured for the location of the plant, and work will be commenced at once. The plant will have a capacity of 30 arc lights and 1,000 incandescents.

LATE NEWS.

The Fairmount Park Transportation Company, of Philadelphia, has made application to the Park Commissioners for permission to issue $500,000 bonds.

A certificate of the lease of the 135th street route of the Union Railway Company, in New York city, to the Metropolitan Street Railway Company has been filed in the office of the Secretary of State. This is the only overhead trolley line on Manhattan Island.

The Metropolitan Traction Company, of New York city, it is reported, will shortly make a 20 per cent scrip dividend. This dividend will bear interest at five per cent per annum, from October 1, and will be payable in cash or stock, at the option of the company, in five years.

Mr. W. D. Sargent, the distinguished telephonist of Brooklyn, is enjoying a thoroughly well deserved vacation at Cape Breton, Nova Scotia, for a fortnight. It is rumored that the bracing air and rest from earnest labors are not alone the attractions, and bachelordom may lose a shining light which has heretofore been of the elusive will o' the wisp nature.

The New York State Railroad Commission met last week at the City Hall, New York city, and heard the application of the Metropolitan Street Railway Company and the Third Avenue Railroad Company for changing their motive power into electricity and compressd air on their Second avenue and Forty-second street lines. Decision was reserved until a later date.

The Rockville & Ellington Street Railway Company, of Rockville, Ct., announce that their corporate name has been legally changed to the Rockville Gas and Electric Company. The company have given up their railway franchise, but will continue as before in the operation of gas and electric light systems. The officers of the company are A. M. Young, president; F. W. Marsh, treasurer; Geo. E. Terry, secretary, and D. F. Burritt, manager.

The statement for July of the Edison Electric Illuminating Company of Brooklyn, N. Y., makes the following showing:

	1897.	1896.	Increase.
Gross	$ 65,688	$ 57,626	$ 8,062
Operating expenses	38,923	34,879	4,043
Net	24,965	20,138	4,826
Gross, seven months	488,896	451,811	37,085
Net	203,743	177,272	26,471

The statement for July of the Edison Electric Illuminating Company of New York, including the high-tension systems, makes the following showing:

	1897.	1896.	Increase.
Gross	$ 162,453 48	$ 156,891 32	$ 5,562 16
Net	59,094 50	57,270 56	1,763 94
Gross seven months	1,391,219 79	1,262,795 96	128,423 83
Net, seven months	630,749 02	541,803 55	88,945 47

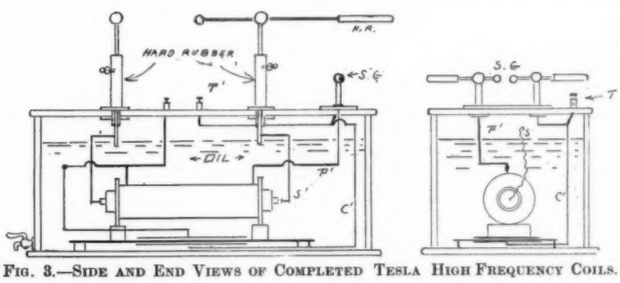


Fig. 3.—Side and End Views of Completed Tesla High Frequency Coils.

Getting a Check Certified In Philadelphia.

In giving some information about the peculiarities of the city of Philadelphia, a Chicago newspaper recently asserted that "Philadelphia was open to the public on Wednesday and Saturday of each week." If that is true, a reason is at once afforded why Mr. C. O. Baker had an experience in Philadelphia banking methods last week. He was over there on Thursday, one of the days, presumably, when the city was closed to outlanders.

As every one in the electrical business knows, Mr. Baker is the head of the large platinum house of Baker & Company, of Newark, N. J. He has an office in New York city and does a large part of his business through the metropolitan banks. Mr. Baker's business experience has been extended and varied, he is a widely traveled gentleman and possesses that easy and certain confidence in himself which is incorrectly supposed to be a characteristic of native New Yorkers only.

An affair of importance called Mr. Baker to Philadelphia last Thursday, as already noted. In the course of his business dealings that day he received a check running into four figures, which was not made payable to his order. The check was drawn by a Philadelphia house of high commercial standing on one of the most prominent banks in the city. After receiving the check it occurred to Mr. Baker to have it certified. So he called at the bank and went to the paying-teller's window.

"Will you kindly certify this?" he requested.

The teller, a gentleman perhaps 60 years old, who looked as if he had spent half a century in the banking business, politely returned the check to Mr. Baker and said, "I cannot certify this without the permission of the drawer of the check or at his request."

Mr. Baker was almost dazed for a second, but immediately asked "Why not?"

"A rule of the banks prevents me, sir," replied the teller.

"Well," said Mr Baker, "this is a brand new experience for me. Of course, I don't want you to break a rule. There must be an excellent reason for such a rule. In my pursuit for knowledge, will you kindly inform me why that rule is in force?"

"I don't know, sir."

"But, my business experience has taught me that I am not demanding anything unusual in asking a certification on a check drawn by one of your depositors. Surely I have the right to know that this check is good."

"Oh my, sir, the check is good. It is drawn by one of our largest depositors," hurriedly answered the teller.

"That may be, my friend," suavely remarked Mr. Baker. "You assure me that the check is good, you ought to know, and consequently I believe you. But the next man I pass this check to may not have the same confidence in my assertion that I have in yours."

"Why, I couldn't certify this check anyway," answered the teller. "I haven't the authority, and besides if I did I'd have to charge it up right away to the account on which it is drawn."

"Wh—wh—why, certainly you would," said Mr. Baker, gasping in amazement, "that's just what I supposed you'd do."

"But suppose there are other checks out on this account? I couldn't give yours the preference over them."

While Mr. Baker was trying to intelligently digest this line of argument, the teller remarked that he would see the president of the bank and ask him if he would break the rule and allow the check to be certified. After a whispered consultation the teller returned to Mr. Baker and announced that he had secured permission to break the rule and certify the check, which he proceeded to do.

"Imagine the business of Wall street being carried on under such banking rules," observed Mr. Baker to a friend to whom he related his experience. "And I understand that the rule the teller quoted to me is observed by all the Philadelphia banks. Phew!"

What to Avoid in an Electric Station.

The danger peculiar to electrical generating works is the liability to shock, which is often fatal if, by accident, any one comes into contact with the conductors when charged to a high pressure, says the London *Electrician*. The contact need neither be very perfect nor direct; provided two parts of the body are made to touch conducting materials which themselves differ in pressure by 1,000 volts or more, or even by much less if the contact with the flesh is very good, a dangerous and possibly fatal shock will result. The ground, especially if damp, is sufficient for one of the contacts, damp leather boots affording no protection, so that any one standing on the ground or on metallic or damp wood flooring can not safely touch a single object charged to a dangerous pressure. If, however, he should be standing upon a dry india-rubber mat, which is an excellent non-conductor, he will come to no harm on touching any number of dangerously charged bodies which are at the same electrical pressure; but if he should simultaneously touch, even through his clothes, two bodies which differ from one another in pressure by about 1,000 volts, the actual amount depending largely on the perfection of the contact, or if, while safely touching highly charged metal, he should touch or pass by hand any conducting article to some one else who is not also insulated, then a fatal shock may follow.

The Mexican Telephone Company now has 2,417 subscribers, a gain of 62 since March 1.

An Important Railway Decision.

Judge Neilan, at Hamilton, Ohio, recently rendered a decision of interest and importance to electric railway men and contractors in the case of August Dietz vs. the Cincinnati & Miami Valley Traction Company, properly the Cincinnati, Hamilton & Dayton Railroad Company vs. the Cincinnati & Miami Valley Traction Company on the question of authority of granting an absolute right of way by county commissioners to a street railway or railroad in the State of Ohio, for the carrying of passengers, freight, mail and express. It is understood that this is a question that has heretofore never been decided in court.

The issue before the court was an action for injunction to prevent the Miami Valley Traction Company from building its railroad on and along certain public roads of the county, as authorized by a grant for that purpose made by the board of commissioners, on November 14, 1896. This grant was made by authority of an act of the general assembly of Ohio, passed May 17, 1894, Ohio Laws, vol. 91, page 285, entitled "An Act to Authorize and Regulate Electric Railroads."

By mutual consent of both parties to the suit the case was tried on its merits. There was little, if any, dispute as to the facts, the questions involved turning mainly on the State constitution and the construction of the statutes. The court, in its opinion, stated that this appeared to be the first time the law of 1894 had been questioned, and that the present suit must be decided upon principle without the aid of previous adjudication.

After disposing of most of the arguments, in a few words, Judge Neilan, in his opinion, continued as follows:

The court is clearly of the opinion that the law of 1894 is not in violation of Section 26, Article II, of the Constitution of Ohio.

The only reason assigned by plaintiff's counsel is that "it allows commercial railroads operated by electricity or other motive power to occupy longitudinally the public highways of the State, whereas other commercial railroads using similar power are only allowed to occupy a part of the public highway."

The court is unable to recognize this distinction.

The statute is very broad and general in its provisions. It applies to every county and to every public highway in the State, and grants the use of these highways to all without distinction.

The fact that the act calls them electric street railways is not material, for it authorizes the use of any motive power other than animal power. The term "street railroad" is doubtless used for want of a better, and because it is one commonly understood.

This brings us to the consideration of the two principal questions in this case; namely, has the legislature the power to pass this law? And, if so, is the Board of Commissioners of this county the public authority in charge of or controlling this highway vested with the power to consent to its use?

It may be stated, as a general proposition, that the highways belong to the State, to the extent, at least, of establishing and maintaining them and regulating their use. * * *

The court is of the opinion that the construction and operation of this street railroad for the transportation of persons and property do not impose any additional burden on the owner of the fee, and he is not entitled to compensation, except where some special private right is destroyed or impaired.

Here is a rapid mode of conveyance through the country, connecting cities, towns and villages. Its vehicles will stop at any point along its route to take on or let off passengers or property.

To say that it is constitutional for a farmer or his wife or daughter to ride to the nearest market town, but it is unconstitutional for him to take a quarter of beef, or his wife to take a basket of eggs or a roll of butter, to market, or if, instead of going themselves, they send those articles on this railroad, is, it seems to the court, an absurdity. * * *

The temporary injunction heretofore allowed is vacated and dissolved, and the petition is dismissed.

A notice of appeal was given.

Good Demand for C & C Apparatus.

On every hand, especially through the principal manufacturers of lighting and power machinery, do we hear most gratifying reports of a rapidly increasing demand for electrical apparatus with which to supply the requirements of the early Fall. We are just advised by a representative of the C & C Electric Company, of New York and Garwood, N. J., that during the last six weeks the number of orders that they have received for all types and sizes of machinery has far exceeded even their most sanguine expectations.

The C & C Company state that owing to numerous unexpected and unprepared-for large orders for their new types of slow-speed multipolar generators and inclosed iron-clad motors, in order to fill their orders promptly, are not only daily increasing their factory force, but will, next week, begin to run their works nights with an extra shift of men. Among their recent orders was one for a large and complete equipment of generators for the first car manufacturing plant to be started in Japan or in Asia, and orders for a large number of generators and motors for export to Central and South America.

Are Railway Companies Responsible for the Damages of Electrolysis?

[*From the Paterson, N. J., Evening News.*]

The question of the responsibility of trolley companies for pipes destroyed by the electrolysis caused by their power currents is one that is bound to get into the courts for settlement in the near future. It will have to be decided whether gas and water companies and private owners of gas and water service pipes are bound to replace destroyed pipes at their own cost, or whether the trolley companies are liable for damage done by their electric currents.

Mr. E. H. Phipps, of the Connecticut Pipe Manufacturing Company, of New Haven, Ct., visited New York city last week.

THE RELAY AND ITS RELATION TO THE TELEGRAPHIC CIRCUIT.

READ BEFORE THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS, NIAGARA FALLS, JUNE 16, 1897, BY THOMAS D. LOCKWOOD.

(Concluded from page 70.)

Culley's "Handbook of Practical Telegraphy" suggests an alternative method of relief, which I think might be an improvement in practice, by saying: "A shunt may be placed across the ordinary coils at intermediate stations, to reduce the resistance of the circuit, for it seems that even if nine-tenths of the current are diverted from the coils by the shunt, the remaining tenth will give better signals than the whole current in a coil whose convolutions are reduced to decrease the resistance.

"The small proportion of current passing through the shunted coil, multiplied by its greater number of convolutions, gives a better signal than the entire current less multiplied."

As to the location of battery, I may say that the first line on which I ever worked was a circuit from Toronto to Ottawa, Ontario, and it had a battery at both terminal stations, and also a way battery at Kingston, about 100 miles from the latter terminal.

It is unquestionably a good plan so far as operation is concerned to distribute the battery power of a long line.

I quite believe that were it not for the inertia of the average telegraph man, and the greater instability of the polar relay, we might often work polar relays operated by reversals with profit and advantage. But I think an attempt to generally introduce such methods and apparatus would be likely to fail, because the why and wherefore is a sealed book to the said average operator.

A paper as long as this one should, in my opinion, be summarized, in order that there may remain no doubt concerning the opinions and convictions of the writer, and I therefore now recite my conclusions:

1. Ampere-turns are what we must rely upon to secure magnetizing power. We must in any case, to have good results, have a liberal allowance of ampere-turns.

2. We can not have a sufficiency of ampere-turns if we undertake to reduce the resistance of relays, by simply giving them a straight or series low-resistance winding, because the magnetizing power of the average telegraphic circuit current is never too great, and we lose in magnetic strength more than we gain in the main current by the resistance reduction.

3. Resistance of itself has no special significance. If we could have a relay of a sufficient number of ampere turns, it would be all the better if it were totally without resistance. But a specified resistance is a measure of a given winding, because the resistance of a wire is proportionate to its length.

4. It is bad practice to connect up a great number of relays in a single circuit.

5. It is bad practice to attempt to relieve such a circuit by connecting with it relays of low resistance, made so by a series winding of coarser wire.

6. The standard 150-ohm relay is a good average instrument for an average circuit, and is based on experiments embracing a number of average conditions.

7. It is extremely bad practice to have high-resistance and low-resistance relays in the same circuit. Whatever the resistance of the relays employed, that of all should be uniform. One relay having a relatively long winding placed in circuit with a number of relatively short windings, will itself work well, but at the expense of others, whose efficiency will thereby be depreciated.

8. If a plurality of lines are worked from the same battery, all should be of substantially the same resistance, even if the shorter or lower resistance ones have to be brought up by adding artificial resistance.

9. The circumstance that a line having relays, which have had their resistance decreased by multiple connections, works well, is no proof or evidence that a line of like dimensions, but with relays of like low resistance and the winding serially arranged, will also work well.

10. The so-called law specifying the relative proportions of line and relay resistance has little force under practical conditions, further than indicating the impropriety of loading a single line with too many stations and relays.

11. To change the relays of a line having many stations, so that their spools are joined in parallel, reduces the ampere turns of each relay 50 per cent.

12. Such a change, however, in addition to reducing the resistance of the several relays to one-fourth of what they were before, largely decreases also the counter electro-motive force of self-induction and the magnetic inertia of each relay, the time constant of the relay being thereby reduced. And as all relays are in the main circuit, the operation of the entire circuit is improved.

13. For these reasons it is conceivable that, in a line of many relays, the advantages accruing from the parallel connections of the relay spools may outweigh the accruing disadvantages.

14. When, therefore, a line is overloaded with relays—and relief by transferring a portion of the relays to other lines is inadmissible—the plan of connecting the spools in multiple, and of thereby reducing the resistance and reactance of the relays, is the most promising and feasible, and its adoption, generally speaking, will be attended by good results.

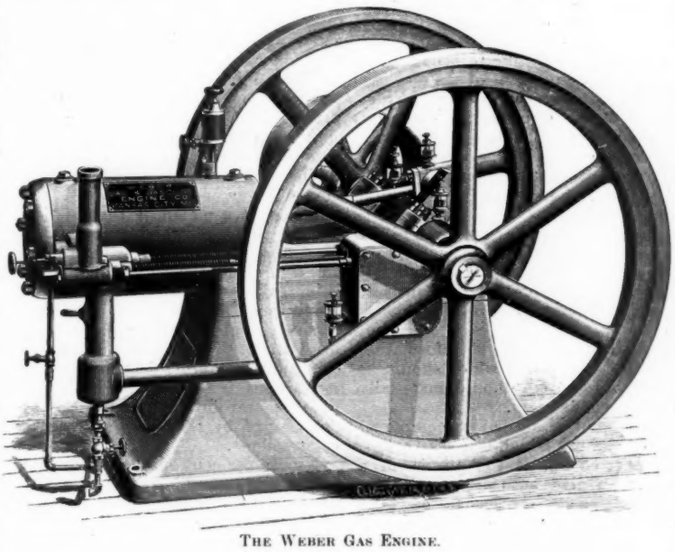
15. To leave the relay magnet spools unaltered and to shunt them by a resistance is a plan which is well spoken of, although I have not tried it. It could scarcely fail to be satisfactory if a switch were placed in the shunt, so that the shunt of any particular instrument could be opened to admit of the full operation of the maximum number of ampere turns, while such particular instrument is being employed in receiving a message.

16. To place a portion of the battery power at a way station would, provided they were properly cared for, ordinarily be of advantage.

17. The introduction of polar relays and operation by reversals under present conditions is not desirable.

The Weber Gas Engine.

In the accompanying illustration is shown a type of gas engine built in sizes from four to 15 horse-power by the Weber Gas and Gasoline Engine Company, of Kansas City, Mo. As will be observed from the illustration, this engine has two balance wheels, and the valve gear and governor are inclosed in a dust-proof housing and run in oil.



THE WEBER GAS ENGINE.

The Weber gas and gasoline engines are simple and compact in construction, and are built for reliable and steady service. They would seem to be well adapted for small isolated electric lighting plants, such as are used for country residences.

New X-Ray Applications.

A considerable number of new applications of the Roentgen rays are reported by *Nature*. Professor Hobday and V. E. Johnson use the rays in veterinary practice. Vandevyver, a Belgian, states as a law that the length of exposure for radiographs through limbs of different dimensions varies as the cube of their thickness. Professor Rüker, in a recent lecture on the transparency of glass and porcelain to the rays, states that the presence of phosphates in china is indicated by their greater opacity. M. Bouchard, in a communication to the Paris Académie des Sciences, states that Roentgen rays can diagnose pleurisy and similar complaints.

THE PREDETERMINATION OF THE REGULATION OF A TRANSFORMER WITH NON-INDUCTIVE LOAD.

ABSTRACT OF A PAPER PRESENTED AT THE DETROIT MEETING OF THE A. A. A. S., AUGUST, 1897, BY FREDERICK BEDELL, R. E. CHANDLER AND R. H. SHERWOOD, JR.

To determine the regulation by this method a wattmeter, ammeter and voltmeter are located in the primary circuit. One set of readings is taken with the secondary short circuited by a stout copper wire, the primary voltage being adjusted until the normal full-load current flows in the transformer or any desired fraction of it. No other data for obtaining a complete regulation curve are required except the one set of readings above mentioned and the magnetizing current. If a wattmeter reading is taken when the magnetizing current is measured the data are sufficient to plot a complete efficiency curve as well as curve for the regulation of the transformer. The two sets of measurements then consist of the reading of a wattmeter, voltmeter and ammeter, first on short circuit with normal current, and second, on open circuit at normal voltage. The wattmeter reading in the first case gives the copper losses; in the second case, the core losses. It is commonly convenient to use the high potential coil as primary in the short circuit measurements, and the low potential coil as primary in the open circuit measurements. A high potential supply is not then needed, and as no power is required except to supply the losses, the complete test of a transformer may be made with an incandescent lighting circuit for the source of supply, a 50-light transformer being tested from one 16 candle-power lamp socket. The total drop is found by laying off in the proper manner the inductive drop, the magnetic leakage drop and the drop due to ohmic resistance. The method is theoretically an almost exact one. Practically, it is an exact method, and less likely to error than the ordinary method of determining the regulation of a transformer by loading it. The results given in this paper, from a long series of tests on seven transformers of various makes, show the reliability of the method, the secondary voltage at full load determined by it varying usually less than one or two-tenths of a volt from the voltage as found by measurement on the transformer when actually loaded. An approximate method (given by Kapp), used by one of our large electrical companies, gives less accurate results. The reader is referred to the data given in the full paper.

The new North Side Electric Railway Company, of East Liverpool, Ohio, has made application for franchise to the City Council for the new North Side loop line to run six miles through the suburbs. The line will cost $80,000.

ELECTRIC METERING FROM THE STATION STANDPOINT.

READ AT THE FOURTEENTH GENERAL MEETING OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, ELIOT, ME., JULY 27, 1897, BY CARYL D. HASKINS.

It has occurred to me that in presenting a paper to the Institute upon such a subject as that which I have selected, I may appear to have departed too entirely from the technical side of our profession, and to have selected a line of argument which would have been more appropriate before a commercial body. But, in my opinion, such is not the case, for I find that almost every merit in, or objection to metering apparatus, or in connection with the use of it, is dependent upon some point involving engineering skill.

The general adoption of the electric meter is in itself an indorsement of the precise methods which characterize engineering practice. It is, indeed, a well established fact to-day, well borne out by data from widely separated portions of the country, that the average electric lighting station can do one-third more business with the same station capacity on a meter basis than it could upon a contract basis, under what were nominally equivalent contract rates, netting at the same time the same revenue per light as formerly. In other words, it is apparently well established that 33⅓ per cent represents the average wastefulness of average human nature in connection with the use of light.

In many central stations to-day, I find that, whilst managers are almost universal in favor of an exclusively meter basis, a large proportion are still in ignorance as to what qualities they should seek and what they should avoid in selecting a meter.

In response to an inquiry as to what merits in a meter are necessary to success, a common reply is, accuracy, durability, registration in a simple unit easily comprehended by the customer, and ability to withstand tampering. These points are probably of importance in about the sequence in which they are commonly stated, but they are too sweeping, too entirely generic and too slightly specific to be in any high degree helpful.

Let us, for example, consider the broad question of accuracy. A meter, which will be accurate under commercial conditions from quarter load to full load within one-tenth of one per cent, or a meter which will start on one per cent of its rated capacity, are neither of them necessarily either the most accurate or the best for general commercial use. This latter point is one which is frequently raised. The fact that a meter will start on one per cent of its rated capacity is in reality no sure criterion of the accuracy of that meter, even on light loads. It is not necessarily even good evidence; yet I find that in very many cases this is almost the only test applied to meters at the time of purchase. The percentage of accuracy at light loads is very important, more important, I believe, than is commonly appreciated; but I am perfectly safe in saying that a meter which will run within five per cent of zero error on five per cent of its rated capacity may readily be a much better meter, even though it will not run at all on one per cent of its rated capacity, than one which will run on one per cent of its rated capacity, but in regard to which no evidence is at hand as to its percentage of accuracy at reasonably low loads.

Ability to start on very light loads is certainly an indication of merit and is important, but it is not nearly as important a point to determine as is the lowest load at which a meter begins to register with fair accuracy. I have inspected a very large number of meters which would start on phenomenally low loads, and which would yet fail to give anything like approximate accuracy at reasonably low loads.

In considering the question of accuracy, therefore, the first two steps should be to determine the accuracy of the meter by actual measurements at full and medium load; and also at a reasonably low load; say, for example, five per cent of the meter's rating.

That low load accuracy is really of vital importance is well shown by the fact that, with the average 24-hour station, in the neighborhood of 15 per cent of the total station output goes to feed one and two lamp loads. Yet in the face of this I have seen large installations of meters reported as entirely satisfactory, tested with frequency and care under admirable systems, but only at full or medium loads, and yet failing to account for more than 50 per cent of the one and two lamp loads, or, in other words, losing to the illuminating company an average of probably seven and one-half per cent of the revenue which their measured station output should give them, after deducting for legitimate losses.

Granting that, having determined the actual percentage of accuracy obtainable at light, medium and full loads, a very important and, in fact, probably the most important evidence as to accuracy has been obtained, there still remains much information of vital importance which should be sought and which should materially influence a decision.

One point which is very commonly neglected, but which is, nevertheless, quite essential, is the ability of a meter to give accurate results for brief periods on overloads. This is a point at which many meters fail, and it is also a point which, odd as it may seem, is intimately related to light-load accuracy. It may be laid down as a rule, that in station operation the smallest meter which will do the work should always be used. Otherwise, however good the meter on light loads, much of the light-load revenue must be lost in the effort to take care of occasional heavy loads. Extremely heavy loads are generally of brief duration, and on these loads a meter should operate with accuracy and also without injury to itself. This, therefore, should be an early point of investigation in selecting a meter.

On alternating circuits inductive loads are becoming commoner every day. The wider use of fan motors and other alternating power devices, the rapidly growing popularity of alternating-circuit arc lamps, and the commoner use of inductive dimmers, all render it essential that a meter should be accurate, irrespective of the power factor. The company which insists upon charging its patrons for power delivered to fan motors on a basis of volt-amperes is obviously rendering itself unpopular, greatly limiting its business and giving its competitor or competitors the best of opportunity for intruding; yet many such companies exist to-day, and they exist not because they are following a wise policy in their own estimation, but because they are ignorant of what they should look for in the meter which they are using.

Again, there are few electric light stations to-day of any considerable size and age which are not operating some smooth-core and some tooth-core alternating armatures. It is, therefore, important that the meters in service at such stations should be equally accurate on any shape of wave; yet many meters fail in this particular; and seldom, if ever, is the point made a subject for investigation in selecting measuring apparatus.

This same consideration holds good in connection with frequency, and this is a point which it is difficult to overcome in most metering devices; but it is one which should be earnestly sought, and which is of importance both to the station and to the consumer.

Even after this long list of points, which must be investigated, as contributing to the broad question of accuracy, there are others which also merit consideration, but to a less degree. Such, for example, as barometric conditions (more especially altitude), temperature and humidity. These all have direct bearing upon the question and all enter into the every-day conditions of central station practice.

Summing up the question of accuracy, we may say, therefore, that the following points should be investigated with care: Ordinary volt-ampere accuracy, accuracy on inductive loads, accuracy on varying wave forms, accuracy on overload, accuracy on varying frequencies, influence on accuracy of variations of temperature, barometric conditions and humidity.

The second point, which is commonly given consideration in the selection of a meter, is that of life. This is a question which must depend more upon good judgment than upon any test which can be applied; for it is in reality no test of the enduring qualities of a meter to run it at excessively high speed for a relatively brief time. The life of a meter, in other words, can not be measured by revolutions, irrespective of the speed of those revolutions; nor can it be determined by the speed at which it rotates alone.

Ninety per cent of all the wear in a meter centers, in the case of motor meters, at the single jewel bearing, which is almost universal. The two chief factors which have influence upon the mere mechanical life are the weight of the moving mechanism and its speed, the variation of the area of the point of contact being, of course, always so small as to be out of the consideration.

A slow-speed meter is usually the best meter, provided the speed be not carried so very low as to threaten the accuracy of the meter on light loads, by reason of being held up by intermittent friction in the form of dust or a spider. Practice has indicated that low speed is more conducive to long life than is light weight of the moving mechanism, although both are, of course, very important. More important than either, however, is the quality of the material used at the points of friction and the ease with which the friction parts can be renewed. The best of sapphire is barely good enough, and the pivot end must be of correct shape, burnished to the highest degree, and its point must be absolutely concentric with the center of movement.

More than half of the meter jewels which are destroyed are rendered useless, not by the rotary motion of the shaft, but by reciprocating motion of the shaft, due to vibration. Hence it is very necessary that the jewels should be in some way cushioned, for vibration can not be always avoided.

These are all, I admit, mechanical considerations, but they compass much of failure or success in electric metering. The purely electrical features of the meter contribute no grave factor of consideration in connection with the life question, always supposing that the copper is ample, and the potential windings are so distributed and so ventilated as to preclude a burn-out.

Passing over the central station man's third factor for consideration, that of the best unit of measurement, as one which is practically a closed question, we are brought face to face with his lamentable fourth point, the necessity that the meter should be able to withstand tampering. It is a regrettable fact that this is a consideration which is coming daily into more prominence; but light has to be sold to all sorts and conditions of people; and apparently the transgressor against meters is even more common than the transgressor against taxes; and this is a growing evil, largely, perhaps, because of the lax conditions of the laws, which can be invoked to protect the meter owner in many of our States.

The methods which are commonly practiced in tampering with meters can scarcely form any proper part of a technical paper; but as this paper may go into the hands of some who need the knowledge to guard themselves and their interests, it can do no harm to briefly state the common methods used, not only that they may be guarded against, but also that meters may be selected which lend themselves least readily to such practices. It is not unusual to place large masses of iron above, below or at the side of meters, but this practice is falling somewhat into disrepute among its advocates, since even they have in time discovered that there is a class of meter which it accelerates.

Electro-magnets, drawing their energy from the circuits under measurement and used as the iron was formerly used, are now not uncommon, and it is difficult to prove in court deliberate evil intent.

Meter covers and bases are drilled, and wires, broom straws and the like inserted. Covers are pried up and healthy colonies of spiders introduced.

Ingenious individuals have even been reported as finding profit in a clever apparatus for injecting fine iron filings into meters by means of a bellows.

All of these things need to be watched for and guarded against.

The question of installation and care of meters is a wide subject, and in connection with it I shall endeavor to mention only a few salient points, selecting those which are most commonly overlooked or neglected.

The most radical cause of trouble in connection with installation is vibration and the consequent reciprocating motion of the shaft; for this reason the most solid of foundations should be selected, the neighborhood of moving machinery should be avoided, as should also partitions of light construction in which doors are located. The rhythmic vibration of moving machinery is infinitely more dangerous than occasional heavy shocks.

Meters should be installed as near to the foundation as possible, not, as is now quite common, at the top of buildings, where the amplitude of all vibrations is, of course, much greater.

Locations where great variations of temperature occur are undesirable. For this reason, also, basements are preferable to attics.

A very common error, causing the loss of very many meters annually by the burning out of the potential circuits, occurs in connection with the metering of power delivered to motors. In the effort to save the very trivial amount of energy passing through a potential circuit, it is very common to install meters on the motor side of the controlling switch. This not only exposes the meter to the full force of

the field discharge, but it also results in the constant cooling and heating of the potential winding, and the resultant expansion and contraction chafes and weakens the insulation and also weakens the wire itself at the turns, opening the path for a final breakdown either by a lightning discharge or by a field discharge.

As to care of meters. It is a fallacy to suppose, as many insist upon doing to-day, that meters should require no care whatever. Almost all meters will continue operative for a very long period without any care whatever; but the cost of a cleaning and testing visit twice annually is trivial as compared with the good results which follow such a system, by reason of the better light-load accuracy obtained. It is not, I think, too strong a statement to say that such a system will have an influence for good, amounting to from three to five per cent on the meter readings annually.

Central station managements have probably given more attention to systematic methods of meter reading than to any other one point contributing to success. The old and faulty plan of reading the dials of a meter at the time of the visit to the meter, is fast giving place to the better system, which provides the reader with a fac simile of the meter dial in blank upon a page of his meter book. This fac-simile is roughly marked in pencil to indicate the position of the hand at the time of the visit. These facsimiles are taken into the office and are all read by one individual who is an expert in meter reading, who sets down the consumption under the facsimile on each page. Such a system commonly reduces the errors from about 10 per cent per month where they not uncommonly stood under the old system, to materially less than one per cent under the new; for surprising as it may seem, it is an extremely easy thing to make mistakes in reading meter dials.

In changing from the old and not infrequently popular contract system, a good many central stations in the earlier days made the grave blunder of going on to the new basis during the winter months, with the result that the highest bills of the year reached the customer after a long period of indulgence under the contract system, and the result at times proved temporarily disastrous.

Even to-day the pernicious influence of uniform bills the year through, which was created by the contract system, still lingers; and the proportion of customers who complain because their Winter bills are materially higher than their Autumn and Summer bills is quite considerable.

It will be said that the explanation is sufficiently simple; but, unfortunately, however good and however simple the explanation, it has proved no simple matter to secure its acceptance and credence. I have lately been much impressed by a system which has recently been adopted by a prominent Western company to at least partially offset this difficulty. During the months which are growing darker, they read their meters a day or two earlier each month, thus arbitrarily creating shorter months, whilst as the year progresses to the period of lighter days, the months are lengthened. This somewhat tends to even up the bill, is apparently quite as satisfactory to the customer, and is certainly entirely just and has created a very great falling off in the complaint list, for the character of the complaint keeps pace with the period of the year. Out of the hundreds of complaints which I receive annually, I find that by far the greater proportion in the Summer are of slow meters and in the Winter of fast meters.

I do not feel that I shall be doing justice to my subject, should I fail to make at least brief mention of the application of meters to the measurement of station output.

The gas companies to whom all central stations look for precedents, long ago found it imperative that they should have some means of determining just how much of their commodity they produced, and sent out through their mains. In all commercial enterprises it is difficult to satisfactorily guide and control a business, unless there be some positive means of determining how much of anything is produced; and it is surely just as important to all electric lighting companies to know how much of their commodity they manufacture as for any other concern. Until quite recently it has not been possible to obtain recording meters sufficiently large to care for the heavy outputs which are now so common, but such meters are now readily obtainable.

The value of a system of station meters must necessarily prove very great, since it furnishes an absolute check system upon coal and water consumption, and engine and dynamo efficiency. Whilst it also furnishes a ready means for comparison between station output, customers, meter indications, line losses, leaks and grounds.

In closing, some brief consideration at least is due to the new fields into which meters are reaching, and to the help special metering features may perhaps give indirectly, as well as directly, to the amplifying of the business of electric light and power companies and to their more economic operation.

There has recently been much interesting discussion regarding the question of the flattening of the peak of the load either by the systematic modification of rates under special time contracts, governing the hours of burning, which does not concern the immediate subject matter of this paper, or by an actual modification in one of several forms in the meter itself, which should practically make the meter automatically control the modification of the rates in such a way as to gain the same end with certainty, as is aimed at in the special contract system.

Whilst personally I have grave doubts regarding the actual feasibility of this plan commercially, in view of other and perhaps simpler methods by which it can be accomplished, I still have much respect for all of the various methods which have been proposed and do not question that there will be at least many cases where they can be advantageously applied. Questions relating to the peak of the load, however, are subject to such great variations locally that a rule which would apply in New York might very readily fail in a system adopted in a smaller town.

It is quite obvious that the best double-rate meter will be that which tends to flatten the load curve of the station, not by oppressing or discouraging the user of light, who must have his light at the period of the peak, so much as by encouraging the use of light at other periods. We do not want to provide means for cutting off the peak so much as we want means for raising the rest of the curve to the same height as the peak. In my personal opinion, it is in this respect that perhaps the most ingenious of all these double-rate meters falls short. I refer to that form of two-rate meter which proportionately increases its rate of record at such time as the local load which it is measuring is highest. This discourages the use of light at the period of the local peak, and if the local peak and the station peak are co-incident, it absolutely fulfills its purpose. But if they are not it fails, because instead of discouraging the use of a large amount of light at the time of the local peak, it should actually encourage it. Encouragement of local peaks, which are not co-incident with the station peak, is beneficial to the central station in the highest degree, for it tends, as I have pointed out it should, to raise the general load curve towards the station peak magnitude.

If two-rate meters are to be used, therefore, I believe that their increased proportional speed should be dependent purely upon the occurrence of the station peak, and should bear no relation whatever to the occuring of the local peak. Such an arrangement can be secured in a number of ways, all of them simple and all of them effective.

One other feature of metering, which has recently come into existence in Europe, is about to make its appearance commercially in this country. It brings with it much of promise for the increase of profitable business for central stations. I refer to the prepayment meter system The drop-a-nickel-in-the-slot-and-get-your-money's-worth meter. In gas practice this system has proved an unqualified success. I am informed that the London Gas Light Company added 6,000 new customers of a profitable kind over and above their average annual growth in a single year; and other companies have had a similar experience.

There is in every large city a considerable area into which illuminating companies have been unable to go by reason of the untrustworthy character of the people who would there be their customers. In other words, because the people in these districts are a floating population without credit, coming to-day and going to-morrow, and yet ready and willing to buy electric light at high rates.

The pre-payment meter throws open this new field and makes it immediately available; and here I predict for it wide usefulness.

Lord Kelvin.

Lord and Lady Kelvin arrived in New York city on the "Campania" last Friday en route to the meeting of the British Association for the Advancement of Science, which begins at Toronto, Ont., on August 18. Aside from being one of the most remarkable scientific men of the century, Lord Kelvin gives evidence of his great vitality in making, at the age of 73, a transatlantic voyage to attend the sessions of a scientific body. He was born at Belfast, Ireland, in June, 1824. His father, Dr. James Thomson, was at that time lecturer on mathematics at the Royal Academical Institute at Belfast, but he removed with his family to Glasgow on receiving an appointment to the professorship of mathematics in the university there. Lord Kelvin's writings are voluminous, and he is a member of many societies, both at home and abroad. He has borne the title of Lord Kelvin since 1892. He has been president of the mathematical and physical section of the British Association five times, and in 1890 he succeeded Sir George Gabriel Stokes, Bart., as president of the Royal Society.

On his arrival in New York Lord Kelvin was met by a number of newspaper men, to whom he said:

"This is my second visit to America. I have not missed a meeting of the Royal Society in more than 40 years, and I have come now to attend the meeting in Toronto. I was here before when the meeting was at Montreal in 1884. We shall leave New York in the morning and go to Niagara Falls. There I shall inspect the great electric power plant. From there we go to Toronto. After the meeting closes we may go to Vancouver, simply to see the country. In that event our stay will cover considerable time. In any event the date of my return is uncertain."

Lord Kelvin said that he had come across the ocean largely to observe, but that he should read a paper at the meeting of the association. He expressed much interest in some of the latest developments in electrical science in this country, such as Mr. Tesla's scheme for telegraphing without wires, and the use of the third rail for transmitting electric power for traction purposes directly and without feeder wires, as is done between Berlin and Hartford, Ct.

"I have not received information regarding Mr. Tesla's methods," said Lord Kelvin, "which is definite enough to enable me speak about them, but I have no doubt we shall hear more of this at the meeting."

In regard to the recently opened garbage destructor works at Shoreditch, England, Lord Kelvin said:

"It is only six weeks since the works were opened, but they have proved themselves to be a great success. Ten tons of 'dust' are equal, we calculate, to one ton of coal for steam making. Enough energy is now obtained to operate the municipal electric lighting plant, and so long as 'dust' is obtainable not an ounce of coal need be used. Whatever dust or refuse is collected has combustible qualities, and is therefore available."

In speaking of Lord Kelvin last week, Mr. Tesla expressed himself as follows:

"His mathematical essays on electricity, magnetism and heat stand almost alone, veritable monuments. The practical public can better appreciate a part of what he has done when I say that for the past 50 years we have been depending on instruments invented by him for the measurement of a great many quantities, and it is impossible to estimate the benefits to science which have come from his instruments, which even now are used in every scientific laboratory in the world. He has given us the perfected mariner's compass, and just imagine what this has done for navigation and commerce; and in ocean telegraphy he has given us the delicate instruments which are now used for recording messages under all seas. If Lord Kelvin were a young man, we might express admiration for his achievements, but his age has almost given sanctity to the eminence of his position."

The days of the fall conventions will soon be here. Niagara Falls and Nashville are the two points to which the electrical delegates will wend their way. Success to them!

ADVANCE INFORMATION

New Electric Railways.

PATERSON, N. J.—The Union Traction Company, whose cars have been running from the Greenwood Lake railroad station in Arlington to Rutherford, has extended the line to Woodridge, and is running cars regularly from Arlington through Lyndhurst, Rutherford and Carlstadt to Woodridge. The fare is five cents. The company is pushing the work of laying the double track, and expects in a short time to have the line completed.

COLORADO SPRINGS, COLO.—The franchise for the proposed short-line electric road from Colorado Springs to Cripple Creek has been granted.

ST. LOUIS, MO.—Within the next six months the new extension on the East St. Louis Electric Street Railroad to Gross's Park and the city limits of East St. Louis will be completed, it is reported.

HARVARD, ILL.—The City Council has granted a franchise running for 50 years to H. S. Williams, of this city; H. T. Windsor and C. J. Luck, of Chicago, to construct an electric railway from this city through Big Foot, Walworth and Fontana, and to Geneva Lake, a distance of 11 miles.

COLUMBUS, OHIO—The Napoleon & Terrace Park Railroad Company, of Henry County, has been incorporated by E. M. Hiner, A. J. Richter, M. Donnelly, James W. Hanna and L. L. Oring. They will construct and operate a railway between the main line of the Detroit & Lima Northern Railway to Napoleon and Terrace Park. Capital, $10,000.

AURORA, ILL.—The street railway company are considering a plan to extend their line up Broadway to Spring street and thence across the viaduct, abandoning the Main street portion of their line.

MANSFIELD, OHIO—The New London & Loudonville Electric Railroad Company has been organized. H. A. Thomas, H. A. Mykrantz, J. R. Swartz, of Ashland; G. F. Shelley, Loudonville; S. J. McCready, New London, and Bert Hank and E. J. Best, Cleveland, were elected directors. H. A. Thomas, president; H. A. Mykrantz, vice-president; F. N. Patterson, secretary, and M. A. Ulman, treasurer.

RICHMOND, VA.—The Richmond Railway and Electric Company expects to extend their western lines to Chesterfield in the near future. The necessary charter has been granted by the county, and all plans have been formulated and approved by the head office of the company, in New York city.

CHARLESTON, S. C. — The City Railroad Company will extend its line from Rutledge avenue to the bridge.

MILWAUKEE, WIS.—The Milwaukee & Waukesha Electric Railway Company, capitalized at $3,000,000, Stutley I. Henderson, stockholder, petitioned for the appointment of a receiver.

WILMINGTON, DEL.—The Wilmington & Brandywine Springs Railway Company has contracted with Vandegrift & Jacobs, of Philadelphia, to build its road, and the work may be begun in a few days.

AMERICUS, GA.—There is a well directed movement to establish an electric street railway in this place. Prominent citizens are interested in the enterprise and a part of the capital stock has been pledged.

POTTSTOWN, PA.—Plans are about completed for the extension of the Ringing Rocks Electric Railway to New Hanover, and work will soon begin in the construction of the road. It is intended to eventually extend it to Boyertown.

GLOVERSVILLE, N. Y.—It is stated that the contract for grading the proposed electric railroad between this place and Mountain Lake has been awarded to Alfred Keith, of Old Town, Me.

JOHNSTOWN, PA.—Greensburg & Mt. Pleasant Street Railway Company, to build a line from South Greensburg to Mt. Pleasant, a distance of nine miles, with a capital of $75,000, has been incorporated.

ST. BERNARD, LA.—Steps are being taken to construct an electric line between this city and Port Chalmette.

Electric Light and Power.

LANCASTER, N. Y.—The new electric light plant for the village is now in operation.

HEARNE, TEX.—The Hearne Gin Company has contracted for a 1,500-candle-power electric light plant, to be placed in service early in September.

JANESVILLE, WIS.—Work is being pushed on the power-station of the Janesville Electric Light and Power Company, at Monterey. Electrician Galloway and Secretary Loring are in charge.

ELMORE, ILL.—A special election will be held here on August 16, to vote upon the question of electric lights.

NEW BRIGHTON, PA.—The Beaver River Power Company has been incorporated. The incorporators are John F. Miner, Jos. F. Mitchell, George D. Douglass, Samuel P. White and Wm. B. Cuthbertson. The purpose is to furnish light and power, but the company secured extensive water rights in this place and Fallston, and is reported to have options on the Beaver Valley Electric Light and Power Company's plant, and that of the Rochester Electric Light Company. It has begun the erection of a power-house here.

PHILADELPHIA, PA.—General contractors, William Steele & Son, 506 Walnut street, have the contract for an addition to an electric light plant located at Second and Susquehanna avenues, for the Northern Electric Light and Power Company, of this city.

WHITEHALL, N. Y. — Messrs. Wetherbee & O'Neil, who have the contract of lighting this place, the power plant to be located here, have commenced surveying the river for the purpose of building dams. A large force of workmen will be employed, as the work must be completed early in October.

PAYSON, UTAH—It is reported that an electric light plant is to be put in at this place.

ANGLETON, TEX.—W. P. McShan, of Greenville, Tex., will erect an electric light plant, etc.

ORANGEBURG, S. C. — Samuel Dibble contemplates the erection of an electric light plant.

JOHNSON CITY, TENN.—The Watauga Light and Power Company has decided upon extensive developments of water-power in the Watauga River at Johnson City.

SCRANTON, MISS.—W. W. Farnsworth, Mayor, may be addressed concerning the construction of an electric light plant.

BREWTON, ALA.—C. D. Henderson, Mayor, can give information concerning construction of electric light and waterworks.

ASHLAND, KY.—The Mayor may be addressed concerning erection of electric light plant.

JACKSONVILLE, FLA. — John T. Parry, engineer of the city's electric light plant, will urge the expenditure of $25,000 on improvements to plant.

BROOKHAVEN, MISS.—A. B. Sanders, of Louisville, Ky., is engineer to superintend construction of city electric light plant.

CUMBERLAND, MD.—The Cumberland City Council has authorized the employment of an electrical engineer to make plans for and supervise the erection of an electric light plant, not to exceed in cost $19,000.

DONALDSON, LA.—John S. Thibaut and others will establish an electric light plant.

BELOIT, WIS.—The Wiley & Warner electric light plant at this place has been purchased by G. L. Cole, owner of the Beloit electric light plant, and M. H. Taylor. It is said the plants will be consolidated.

ADAMS, MASS.—The Adams Electric Light and Power Company is soon to put in a complete and entirely new equipment for house and store electric lighting.

DANVILLE, OHIO — The Marion branch is to have an electric plant to cost $10,000.

NEW RICHMOND, WIS. — Apple River Power Company will develop water-power on the Apple River at Somerset. The power, which is to be used for manufacturing purposes, is to be transmitted to this city by electricity.

LEBANON, OHIO—R. B. Corwin, Town Clerk, may give information concerning lighting.

ROMEO, MICH.—Isaac Crawford, chairman electric light commissioners, may give information concerning construction of electric light plant.

FRAZER, MINN.—Ray W. Jones, secretary of the Commonwealth Lumber Company, has made arrangements for an electric light plant for mill.

New Telephone and Telegraph Companies.

COFFEEVILLE, MISS.—The Blount's Mineral Well and Telephone Company has been organized, with I. T. Blount, president; H. T. Gaines, secretary, and G. W. Armstrong, of Coffeeville, treasurer, to construct telephone line, etc.

STOCKTON, CAL.—Sierra Telegraph Company has been formed by Thomas S. Bullock, Sidney D. Freshman, S. D. Woods, George A. Brown, Jr., and R. L. Beardslee, to carry on a general telegraph business. Capital stock, $12,400, all subscribed.

IRONTON, KY. — The Lawrence Telephone Company has been organized to construct telephone system. Capital stock, $12,000.

NORTH WILKESBORO, N. C.—John T. Finley is interested in the establishment of a telephone system.

PIPESTONE, MINN.—The Southwestern Minnesota Telephone Company has been incorporated by E. A. Cass, Oswald Cass, Mary M. Robinson, Louisa M. Cass and Thomas F. Robinson. Capital stock, $10,000.

LOCKPORT, N. Y.—The Bell Telephone Company, of this city, have decided to place part of their wires underground. Many of the poles of the company are badly rotted, and it is considered cheaper in the long run to bury the wires.

CARO, MICH.—The Moore Telephone Manufacturing Company, of this place, has secured a franchise to construct and operate a telephone exchange at Vassar, and is putting up a line from here to that place, which is expected to be completed in a few days. From Vassar, a line will be run, by way of Reese, to Saginaw, where it will connect with the Valley City Telephone Company, which will have an exchange in operation at both Bay City and Saginaw in about three months.

New Incorporations.

TROY, OHIO—The Hobart Electric Manufacturing Company has been incorporated, with a capital stock of $30,000.

NEW HAVEN, CT.—The New England Railway Construction Company has been organized for the purpose of building and equipping street railways, electric light plants, waterworks, gasworks and pipe lines. The capital stock of the corporation is $30,000. Thomas M. Waller, New London; S. Harrison Wagner, New Haven, Israel A. Kelsey, West Haven, stockholders.

JACKSON, MICH.—A company has been formed with E. S. Hobbs, president; C. C. Bloomfield, vice-president; L. B. Trumbull, secretary; E. D. Warner, treasurer, and others; for the manufacture of electric signals for street railway, and railway crossings. Capital stock of $100,000 paid in.

KINGSTON, N. Y.—The Kingston Automatic Life Saving Car Fender Company has been organized with a capital stock of $25,000. The main office will be at No. 12 Strand, and the fender will be made in this city. The company will manufacture the Towne patent fender. The officers are John N. Cordts, president; A. H. Clarke, vice-president and secretary; G. D. B. Hasbrouck, treasurer; Daniel R. Gillie, manager.

Kindred.... ...Interests

The Connecticut Pipe Manufacturing Company, of New Haven, Ct., report a good demand for their well known cement-lined conduit, which is in successful use in all parts of the country.

The James Leffel & Company, of Springfield, Ohio, has been awarded a contract for the new water-wheels for the addition to the plant of the Niagara Falls Hydraulic Power and Manufacturing Company.

The John A. Roebling's Sons Company, Trenton, N. J., has prepared a valuable cloth-bound book entitled "Wire in Electrical Construction." It contains data and carefully prepared tables of great value to all wire users.

Mr. R. B. Corey, Havemeyer Building, New York city, is making good headway in the introduction of Simplex wires and cables in the territory which his agency includes. Columbia lamps and several other good things are also handled by Mr. Corey.

Brush arc machines, especially in the large units, continue to interest the projectors of new stations as well as those managers who are modernizing their plants. The Brush Electric Company, Cleveland, Ohio, issues numerous pamphlets and circulars of interest to lighting men.

The Western Electric Company, on August 16, removed its New York offices to its new building, 57 to 67 Bethune street, near West street, where a store has been opened for the sale of its extensive line of electrical supplies. The store in the old Thames street building will be maintained.

The Joseph Dixon Crucible Company, Jersey City, N. J., has issued a pamphlet in which the merits of lead paints and Dixon's silica-graphite paint are interestingly compared. In a note to the ELECTRICAL REVIEW the company says: "Much has been said and written lately concerning protective coverings for iron structural work. The growing tendency among those who have given the matter careful consideration is to add some form of carbon to the red lead used, or to discard red lead altogether. This has caused the red lead manufacturers to issue pamphlets condemning the use of carbon—especially graphite. The statements of the red lead people have been so wide of the facts that we have made reply by issuing this pamphlet."

The Standard Underground Cable Company is sending out the following notice and guarantee to its customers:

"Our attention has been called to the somewhat extravagant pretensions put out by interested parties, wherein claim is made, in substance or effect, of an exclusive patented monopoly of paper insulated electric cables and wires. We have been manufacturing and selling wires and cables of that kind for many years, and, under advice of counsel, we have no doubt whatever as to our right to do so. We therefore advise you that, as regards any such wires and cables which you may purchase from us, we will be prepared at any and all times, at our own charge and expense, to defend any suit or suits brought against you for infringement of the patent referred to, we to be promptly notified of such suit or suits, and to be allowed an opportunity to make defense therein."

A Legal Decision On Transfers.

An interesting decision relating to street railway transfers was recently rendered in Atlanta, Ga., by United States Judge Newman and Circuit Judge McCormick. The Old Colony Trust Company, of Boston, brought suit as trustee for the holders of $2,025,000 bonds of the Atlanta Consolidated Street Railway Company to enjoin the city of Atlanta from enforcing a free transfer ordinance. By the decision the ordinance is declared invalid and inoperative.

In its opinion the court said: "One continuous ride is one thing, and two or more rides, with the necessary stoppage and letting passengers off and taking them on, is another and entirely different thing. Even if the city held, under legislative acts, the power to regulate or fix rates of fare for street cars, it might be gravely questioned even then if it had the power to pass the ordinance requiring transfers."

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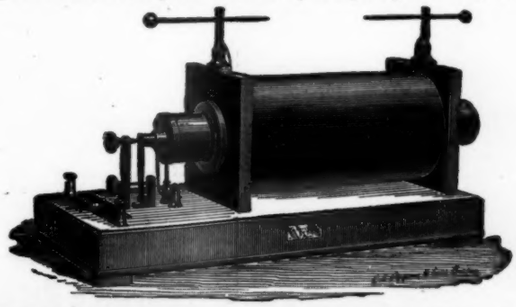

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Electrical.... Patents.

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED AUGUST 10, 1897.

587,693 Signal receiving apparatus; W. F. Banks, Milford, Ct.—Consists of a normally short-circuited receiving magnet, an armature for controlling the said short circuit, a magnet for controlling the armature and a retarding device for governing the movement of the armature.

587,698 Apparatus for detecting electrolysis of underground pipes and locating transmission losses; H. P. Brown, New York, N. Y.

587,720 Electric railway system; Stephen D. Field, Stockbridge, Mass.—Consists of a slotted conduit embodying metal frames, insulators flexibly mounted on arms projecting from said frames, and a working conductor composed of magnetic metal flexibly suspended from said insulators.

587,733 Electric controller; S. Harris, Johnstown, Pa.—Consists of a rotatable drum carrying a plurality of contacts and a coil surrounding a part of said drum and electrically connected to any suitable part of the circuit.

587,747 Igniter for explosive engines; P. Mueller, Decatur, Ill.

587,750 Electric arc lamp; J. McLaughlin, Chicago, Ill.

587,752 Electric railway switch; M. J. M. O'Hara, Wilmington, Mass.—Consists of a main line, a branch line, a switch-tongue, a horizontal pivot, on which said tongue is movable vertically, and horizontal bolts, normally supporting said tongue and adapted to slide out from under said tongue.

587,764 Wire for armature windings; S. H. Short, Cleveland, Ohio—A conductor for use in winding armatures and the like composed of more than two wires twisted together and having plane surfaces in contact at every point.

587,765 Armature for dynamo-electric machines; S. H. Short, Cleveland, Ohio—A plate or lamination for armature-cores, having the ends thereof beveled to lines radial to the armature center, the outer edge curved to the circumference of a circle struck from the center of the armature, and the inner edge straight.

587,769 Electric motor; J. L. Thoma, Kansas City, Mo.

587,770 Apparatus for causing chemical changes in gases; N. Van Sleen, Oudshoorn, Netherlands.

587,782 Electro-depositing device; J. Bossard, Dubuque, Iowa.

587,792 Electric railway; R. L. Caldwell, Cleveland, Ohio.

587,798 Electric meter; J. F. DeBauw, Brussels, Belgium.

587,805 Trolley-hanger; T. Fletcher, St. Louis, Mo.—A trolley wire, a flexible strand or wire, means for connecting it to the trolley wire at each end and a suspending device, the flexible strand having a loose connection with said suspending device whereby the strand may move freely upon the suspending device at the point of connection in response to the vibrations of the trolley wire.

587,818 Lightning arrester; E. M. Hewlett, Schenectady, N. Y.—Consists of arcing electrodes, a non-inductive resistance in circuit with one of the electrodes, and a blow-out magnet having the ends of its coil or coils connected to the non-inductive resistance at points between which there is a difference in potential due to the dynamo current following a lightning discharge.

587,822 Automatic electrical regulating device; E. Hoffmann, Charlottenburg, Germany.

587,823 Appliance for closing doors; E. F. Holbrook; Chicago, Ill.

587,829 Process of treating alloys for manufacturing electrodes; L. P. Hulin, Modane, France.

587,838 Circuit breaker; H. Lemp, Lynn, Mass.—Comprises a pair of fixed terminals, a bridge normally held in contact with the fixed terminals by a spring and a rheotome-hammer for opening the contacts.

587,868 Commutator and lead; S. H. Short, Cleveland, Ohio.

587,869 Field magnet for dynamo electric machines; S. H. Short, Cleveland, Ohio—Composed of a plurality of solid magnet cores, each having one end furcated by intersecting slots, combined with a yoke cast about said furcated ends of the magnet cores.

587,870 Trolley; S. H. Short, Cleveland, Ohio.

587,871 Armature; S. H. Short, Cleveland, Ohio—A slotted core, an end ring at each end of the core having peripheries adapted to support the armature inductors beyond the core, insulating covering surrounding said peripheries and protecting the inductors from them, and troughs of insulating material in the core slot, said troughs projecting beyond the core.

587,883 Device for examining articles by Roentgen rays; E. Thomson, Swampscott, Mass.

587,921 Apparatus for generating constant electric current; C. N. Black, New Haven, Ct.

587,931 Burglar alarm; C. Coleman, Chicago, Ill.—Consists of a plurality of parallel insulating strips, a plurality of parallel conducting strips secured to the insulating strips and arranged so as to overlap.

587,937 Regulating electric motors; A. G. Davis, Washington, D. C.—The method of increasing the torque of a tandem motor system, which consists in neutralizing by a phase-advancing device part or all of the lag of the intermediate circuit or circuits.

587,998 Electro-pneumatic alarm; G. W. McKenzie, Beaver, Pa.

588,004 Electric alarm; R. Penny, Soldier's Home, Ohio.

588,021 Means for controlling electric motors; S. H. Short, Cleveland, Ohio.

588,035 Electrolytic apparatus; W. Thum, Newark, N. J.

588,040 Process of making filaments for incandescing mantles; W. L. Voelker, Elizabeth, N. J.

588,053 Overhead trolley system for electric railways; S. H. Clauffiel, Johnstown, Pa.

588,084, 588,085 Process of and apparatus for electro-chemical treatment of straw or other fibrous materials; G. H. Pond, Ashburnham, Mass.

588,087 Machine for justifying typographic impressions; I. Risley, New York, N. Y.

588,097 Electric railway system; L. E. Walkins, Springfield, Mass.

588,101 Electrically operated loom; E. D. Chaplin, Cambridge, Mass.—An electric filed magnet and a coil armature wholly exterior to the coils of said magnet, one of which is reciprocable relatively to the other, a shuttle-carrier connected to the reciprocable member, a shuttle mounted on the carrier, means to produce a current in the armature and a device for reversing the direction of the current at each stroke, whereby the shuttle is reciprocated.

588,104, 588,105 Electric locomotive; R. Eickemeyer, Yonkers, N. Y.

588,111 Current-collecting device for electric railways; R. M. Hunter, Philadelphia, Pa.

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